Marine Engineering
and Shipping Age

Volume XXXIII **June, 1928** **Number 6**

Published Monthly by
SIMMONS-BOARDMAN PUBLISHING COMPANY
34 North Crystal Street, East Stroudsburg, Pa., with executive offices at 30 Church Street, New York
H. H. Brown, Editor
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Subscription price: United States, Canada and Mexico, $3.00; foreign countries, $4.00. Single copy, 35 cents.

Marine Engineering and Shipping Age is a member of the Associated Business Papers, Inc. (A. B. P.), and the Audit Bureau of Circulations (A. B. C.).

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A Promising Outlook

THE enactment of the Jones-White shipping bill, designated officially as the Merchant Marine Act of 1928, brings at once a widespread feeling of optimism throughout the marine industries. Both shipowners and shipbuilders are looking forward with confidence to the development of private American shipping in the foreign trade, the sale of Government-owned tonnage to private owners, the construction of new vessels and the improvement of existing ships. Immediately after the signing of the bill the Export Line applied to the Shipping Board for a loan for the construction of four 9,500-ton, 14-knot combination passenger and cargo steamships for operation in the Mediterranean service in which it is now operating a fleet of 21 vessels previously bought from the Shipping Board. This line contemplates building four new vessels every two years for the next six years.

While this is the first proposal to take definite form since the signing of the bill, the favorable provisions of this legislation are leading other shipowners to consider new shipbuilding projects, as outlined in the news columns of this issue. Captain C. A. McAllister, president of the American Bureau of Shipping, predicts that, within a year, at least 150,000 gross tons of new ships for foreign trade will be under construction in American shipyards in addition to the volume of tonnage required for local and domestic shipping. This conservative estimate is based on projects actually contemplated and substantiates the general belief that this legislation means a new lease of life for the shipbuilding industry.

The new shipping bill not only paves the way for building modern, high speed ships for foreign trade but its passage by large majorities in both branches of the Congress shows that the nation is becoming ship-minded and realizes the importance of developing its merchant marine as an indispensable adjunct of its world-wide commerce. This is one of the most significant things in connection with the enactment of this legislation and amply justifies the optimism now prevailing in the marine industries as to the future. American citizens have experimented long enough with Government shipping. They realize that in that direction there is no possibility of material progress. By supporting the Jones-White bill they have given evidence of their faith in the ability of private enterprise to transform a stagnant industry into a business capable not only of earning profits but of returning dividends of untold value to the entire nation. They have also given evidence of their realization of the fact that American shipowners cannot compete in foreign trade without Government aid, and of their desire to provide such aid. As soon as the beneficial results derived from the liberal mail contracts and construction loans provided in the Jones-White bill become apparent to the nation as a whole, it is reasonable to expect that the further aids required for the building and operation of cargo vessels will be forthcoming and the future of the merchant marine assured.

Straight Lines

SOME few years ago one of the British railway companies built two cross-channel steamers that were practically duplicates in every particular, save one; this difference was a peculiar and, as experience proved, a most interesting one. The first steamer was constructed in the ordinary manner, with cambered decks, tumble home and internal subdivision, stateroom bulkheads and so forth, following the form of the ship's sides. The second vessel had flat decks, fore and aft bulkheads parallel to the keel and divisional bulkheads and partitions at right angles to them throughout. In other words, the appearance of the berth cabins and public rooms simulated as closely as possible that of rooms on shore in their effect upon the

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eyes and the general sensibility of their occupants. The second vessel was reported to be the more popular of the two with the traveling public and it was intimated that the main reason for this was the fact that seasickness was experienced much more rarely by passengers occupying the square, flat-topped and flat-floored rooms.

At first thought, the above statement seems to border upon the ridiculous but there is fairly good evidence, far removed from shipboard experience, that the claim is well founded, that irregular, slightly curved and "out of plumb" lines, when substituted for those which one is accustomed to see as regular, straight and square, do have an irritating effect upon the mind and may, as a result, react upon one's physical functioning. Everyone is familiar with the annoyance which a crookedly-hung picture or a chair or table out of plumb causes, and seeks at once to correct the imperfection. For certain nervously-constituted people the forced continuation of such petty irritation may easily become unbearable, but, in substituting a room on the average small ship for a room in the average house ashore, very similar conditions or influences are brought into play.

But there is far more specific and convincing testimony in support of the argument. The general manager of one of our largest railroads recently related to the writer the following experience, of which he had personal knowledge and could fully vouch for: A passenger train having been derailed, a wrecking crew was set to work to clear things up. The foreman, described as a "hard-boiled roughneck," went into the baggage car to take out the pin of one of the trucks, the car being tipped at a slight angle, presumably not more than 10 degrees. After about 15 minutes he came out, violently "seasick." Four or five other members of the crew had a similar experience. There was, so far as known, nothing in the neighborhood of the wreck, in the way of chemicals or gas, which could cause nausea, and the men complained of the effect upon them of working with their surroundings out of true. It sounds strange, but, nevertheless, is a fact.

While the planning of cabin arrangements and joiner work to avoid seasickness is something which has never occurred to the minds of naval architects except, possibly, in the case of the steamer mentioned earlier in this article—and that is doubtful—it is, at least, an interesting thing to add to the sum of one's professional knowledge.

There are, however, other and more material reasons for adopting straight lines when possible. Except for weather decks, camber is of very doubtful utility and it certainly adds to the complication and cost of construction. An examination of the midship sections of modern vessels shows a decided tendency towards its abandonment in protected spaces. The building of straight deck houses of varying widths but with sides parallel to the centerline may lose space in some places, but can be made to gain it in others. Paralled deck sheer, although the general rule in modern vessels, was often departed from in older ones and much fairing up and tapering of panels and other joiner work to produce "eye-sweet" lines in the long, sweeping passages and galleries, which were characteristic of the bygone age of "steamboat" architecture, was resorted to. An examination of the joiner work in some of our older steamers often shows no two panels of the same depth, in spaces towards the ends of the vessels the deck heights are varied and everything else faired in to suit. Some of this joiner work cannot fail to excite one's admiration, but think of the cost of such work today! Straight lines may be anathema to the old ship carpenter, but they certainly reduce cost—if they also reduce seasickness, so much the better!

Naval Armament and Air Force

SO RAPID and phenomenal has been the development of aerial navigation since the World War, that an expression of opinion as to the relative merits of battleships and air craft by anyone unfamiliar with the subject (and this, in view of the progress which has been made, may well be taken as including all who have not made an intensive study of it) is in the nature of an impertinence. Nevertheless, the controversy is of such vital importance and interest to everyone in any way concerned with marine affairs that the layman may perhaps be permitted to speculate as to what the future may bring forth and which arm—battleship or aircraft—will prove to be the eventual bulwark of the nation's defense, or the vital and effective backbone of offensive warfare.

So radical is the change in our general view of military and naval affairs, which the advent of airship and airplane has brought about, that one can only expect equally radical and widely divergent views as to facts already established or claimed to be established, and their possible effect upon future policies in the preparation for war, both on land and sea. And such is indeed the case. In a book entitled "The Great Delusion," which appeared last year in Great Britain, after an exhaustive discussion of the subject from what will, by our air service friends at least, be considered a reactionary point of view the following conclusion is reached: "Cool and dispassionate consideration of the facts will show, however, that 'air power' is illusory, and 'air supremacy' a will-o'-the-wisp. Development of air craft for war purposes is a sheer waste of men and money, and, moreover, constitutes a grave danger, since expenditure upon unreliable and futile weapons is a sure road to defeat."

On the other hand, the opinion is expressed by those who are presumably quite as well informed as the author of "The Great Delusion" that the battleship has already been rendered obsolete by the airplane, that no ship can protect herself from aerial attack or successfully withstand the effect of bombs exploding in

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the water anywhere near her and that, in a few years' time, the combat between sea and air forces will become "grotesquely and pathetically one-sided."

As is nearly always the case in such heated discussions, the truth of the matter, so far as the "man on the street" can get at it, lies at present between the two extremes. The best and most informative summary of the relation of sea and air forces which the present writer has encountered was given in a series of articles published a few months ago in the Liverpool *Journal of Commerce* under the caption of "Sea Power, Air Force or Disarmament." The British writer, while evidently inclined from his personal experience to the air side of the question, has obviously endeavored to give a fair and unbiased summary of the present situation. He quotes freely from various authorities of both parties to the controversy, among them those already mentioned here, and provides a fairly clear view of things as they are and abundant food for thought as to the future. Concluding, he says: "In looking over the arguments of both sides, it is satisfactory to note that the exponents of the policy of retaining existing primary weapons realize the immense importance of the new arm and, while not in favor of scrapping fleets and trusting entirely to air power, they believe in developing that power to the utmost so as to bring the former to its maximum efficiency." Unwittingly, one must believe, the author of "The Great Delusion" contributes support to this same point of view, as follows: "Countless times in past history inventions have been made and perfected, which have been heralded as being the means of ending warfare. The mine, the torpedo, the submarine, the balloon have all been predicted as the end of navies and armies, but in every case a counter has been devised, and the new weapon has become merely an arm of that service it was originally intended to replace. So it is with the airplane." The last few lines contain the essence of the whole matter.

What the future may bring forth, no one can even safely surmise but in view of present and fully proved accomplishment one can readily agree that the airplane has become an effective "arm" of the naval service, perhaps the most effective which it has at its command. Aircraft have already vastly changed the conduct of naval operations and the aspect of naval strategy. Close blockades of seaports may no longer be undertaken; the submarine rendered them hazardous, the airplane practically makes them impossible. No ship can be so constructed as to successfully resist heavy bombs. Her only safety lies in her speed and maneuvering power; her best defense is her ability to carry the war to the enemy, to meet aeroplane with aeroplane; but vital as is this change in the detail of naval defense and offense, the underlying principle must remain the same, for until aircraft have reached a far greater stage of development than the present, the battleship or at any rate the naval fleet of swift and powerful vessels must remain the backbone of all major naval operations.

While the naval aircraft developments in different countries are carefully guarded, it seems to be generally conceded that nothing has yet been built which can be depended upon to carry heavy weights for long distances. Until this is accomplished, the surface ship, no doubt greatly modified but still, in every sense, a battleship, must be the main dependance for both offensive and defensive actions—it seems equally certain that the aeroplane will be among her most effective weapons.

Neglected Losses in Ship Propulsion

WHILE it is true that in the majority of cases the *quantitative* results of model tank tests are of direct value only to the designers of the particular vessel or model concerned, the *qualitative* results, as indicating the tendencies of certain modifications in hull and propeller design, are often of the greatest and most material interest to both the builders and operators of power propelled vessels.

Casual observation of the bottom, of the various and widely differing types of craft, which are dry docked daily in any active metropolitan ship repair plant, is likely to lead one to the belief that in the hurry and pressing need of a great port like New York many things, which in a general way are known to almost everyone concerned with ship operation and in a most particular way are recognized by those familiar with model tank results, are either forgotten, or thrown into the discard as of no practical importance.

If there is any one thing which the model tank makes clear, it is the importance of the bottom condition of vessels, not only of the painted surfaces but of the various structural details which affect resistance, as well. In fact, bottom examination shows many imperfections which are in no way due to neglect in maintenance but have their origin in the original design, having apparently been with the ship from the day of her launch.

To consider the matter in reverse order, perhaps the most noticeable potential source of waste which one notices on a dry dock is the great disadvantage under which a large proportion of the screw propellers of small and moderate sized vessels operate. The importance of the most undisturbed and regular flow of water to the screw which can be obtained has been most clearly demonstrated by tank experiment, particularly in the past few years, and yet propellers fitted close up to wide and square-cornered stern posts seem to be the rule, rather than the exception—while the rudder post often offers the maximum resistance and obstruction to wake flow that a minimum sectional area of material will permit. Of course, one is at once met by the argument that "shaped" body and stern posts with the propeller set well clear are expensive and that, any way, except

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for high speed ships, the "game isn't worth the candle." This may be true for the small harbor tug or lighter, but even with them one may hazard the guess that a little more intelligent attention to propeller location and surroundings might have a surpassingly beneficial effect upon the coal pile, to say nothing of increased handiness and the elimination of vibration.

Coming to twin screws, similar conditions are often in evidence. The blade tips have insufficient clearance from the shell plating and the struts have an ugly, eddy-producing section with the propellers fitted close behind them; all of which does not help the propeller and is likely to cause undue vibration. In most vessels, even in some of fair size and very considerable speed, no fairwaters are fitted to either main or intermediate struts. The important effect of fairwaters in decreasing resistance and improving propeller action is admitted but their absence is explained on the basis of "practicability." They are expensive, bothersome to keep in condition and if struck and distorted may cause serious shaft damage. All this is undoubtedly true, but one can hardly view the results with equanimity. Annular rings from 4 to 6 inches deep, square cornered and at right angles to the shaft, two making direct head resistance and two dragging eddies, cannot fail to have a very appreciable effect upon a vessel steaming at 16 to 18 knots and one cannot but wonder if a little money spent upon carefully designed and constructed fairwaters, fitted to shaft bossing and struts, would not return a good rate of interest on the investment.

Turning to the propellers themselves, in the majority of craft seen upon a New York dry dock they are of cast iron, of rather heavy section. In small harbor vessels, no fault can be found with this. Breakages are frequent and unavoidable, and comparatively brittle wheel material is an advantage rather than otherwise. No propeller can be expected to stand up invariably to this sort of treatment and tough bronze blades may well lead to a damaged engine in addition to a smashed wheel. All things considered, good cast iron is probably the best material for the propellers of average harbor craft—it is certainly the cheapest—but this is no reason why an excess of material should be used. Many wheels indicate that the policy of "playing safe" has been carried to an extreme and the thick, clumsy blades which result make anything but an efficient wheel. In many cases hubs are of bad form, wide and flat on the after side, with no cap at all, or, at best, a short stubby one is fitted. Experiments show that hub form is an important factor, fore and aft fairing and elongation with a tapering cap showing a material improvement in efficiency over the more usual type. In larger vessels sectional wheels are often fitted, but with little or no apparent effort to fair in the hub. The large masses of cement often used to cover the nuts at the base of the blades are a great hindrance to proper performance, tank results showing a loss of as much as 5 percent in some cases, as between the built-up propeller with projecting nuts and the solid wheel with properly designed hub.

For sizeable ships, running at fair speed, there is little question as to the much greater propulsive efficiency to be obtained from well designed bronze wheels. Experience with actual vessels, to say nothing of model results, shows an advantage of from 5 to 10 percent to lie with the thin bladed, solid wheel as compared with the sectional type of cast iron. Bronze wheels are expensive, but for a vessel on a regular run of, say, 150 or 200 miles the material saving in coal resulting from their use should soon offset the greater first cost.

Another fertile source of annoyance, if not an actual loss from the propulsive point of view, is the bilge keel. One sees a fair number of these at the dry dock and, as often as not, they are rough, with jagged edges, and noticeably out of fair. In many cases they are too long, extending into the entrance lines forward and the run aft in which case they are likely to cut across the natural flow of water around the hull and create both head and eddy resistance. Experience seems to show, in certain cases, a very real loss from appendages of this character. Their fitting should not be resorted to unless considered absolutely necessary and when used they should be confined strictly to the midship portion of the vessel, which, of course, is the position for developing their maximum effect in reducing rolling.

Lastly, coming to paint, volumes might be written (and have been, for that matter) on the protection of the bottoms of iron and steel ships. When the little time allowed for painting is considered, the excellence of the results obtained with the standard brands of bottom paint is surprising. Not that the dry dock reveals perfection by any means—far from it—but in old ships periodically docked and carefully painted the plating is more often than not very fairly clean and well covered after a year's service in northern waters. With new vessels, conditions are usually not so good and at the first dry docking it is often the case that little or no paint remains on the shell plating. Mill scale is at the bottom of this, and the advisability of launching with no bottom paint, if dry docking can be arranged to follow in a few weeks, is worth considering. This pretty well insures the complete elimination of the mill scale, leaving a bottom which, if allowed to dry properly before paint is applied, will hold paint as well as that of an older ship. If first class paint is used, satisfactory results can usually be attained provided sufficient time is allowed, in the old ship, to thoroughly dry the bottom and, in the new, to get rid of the mill scale.

Of course (as was pointed out in a former article) bottom care demands reasonably frequent dry docking. No paint can be expected to withstand the action of sewerage and chemicals to be found in certain localities and the same applies in a general way to all service in confined and crowded waters. Seagoing vessels are, in large measure, exempt from the chemical and physical enemies with which their smaller sisters have constantly to contend.

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The President Signs the Shipping Bill

Jones-White merchant marine bill becomes a law—Will aid shipping and shipbuilding

By Harold F. Lane

WASHINGTON, D. C.

THE Jones-White merchant marine bill, which has inspired new hopes of the development of a privately-operated American merchant marine in the foreign trade by its provisions for making loans to assist in the construction of vessels by private operators and for increased compensation for carrying foreign mail, became a law on May 23 when it was signed by President Coolidge. Little doubt had been felt that he would sign the measure, because he had expressed himself on several occasions as believing that the principal provisions in the bill would tend to benefit the commerce of the country, although he has indicated that he did not like the provision requiring the approval of five out of seven members of the Shipping Board before it could sell a government-owned ship. The President has indicated, however, that he does not feel that the government should spend very much money under the provisions of the bill authorizing the reconditioning and replacement of Shipping Board vessels.

The White bill, including most of the provisions of the Senate bill with some changes, but including also the many additional provisions for increasing the construction loan fund and for mail payments, was passed by the House on May 5, after two days of debate, but without a record vote. Except for minor perfecting amendments there was little change from the form of the bill as reported by the committee on merchant marine and fisheries, on April 17. A large part of the text of the report describing the bill was published in the May issue of MARINE ENGINEERING AND SHIPPING AGE.

Amendments Defeated

Representative Wood, of Indiana, although favoring the bill, made several unsuccessful efforts to change certain of its provisions by amendments, including one to provide that loans for building ships should be limited to $10,000,000 for one person or company in one year, and one to provide for loans for the building of cargo vessels to the full amount of their cost, without interest. The first was defeated on the ground that the cost of construction of a ship would be much greater if complete provision for its construction could not be made in advance and if the transaction were left to the uncertainty of obtaining an additional loan in another year.

An amendment offered by Delegate Houston, of Hawaii, taking Filipinos out of the classification of aliens as members of crews, was adopted by the House but was later stricken out in the conference report.

After the measure was sent to the Senate conferees were appointed as follows: Senators Jones, of Washington, Mc Nary, of Oregon, Johnson, of California, Fletcher, of Florida, and Ransdell, of Louisiana, and Representatives White, of Maine, Lehlbach, of New Jersey, Free, of California, Davis, of Tennessee, and Bland, of Virginia.

The conference report was adopted by the House with practically no further debate on May 14 and by the Senate after some debate on May 16, by a vote of 51 to 20.

Conference Changes

Except for the renumbering of titles and of sections made necessary by the elimination of Title V of the House amendment and by the transferring of section 804 of the House amendment to the end of the bill where it appears as section 706, the changes in the conference report from the form of the House amendment are few in number and only three of them were described by the conferees in their statement as being of importance.

Paragraph (c) of section 405 of the House amendment provided that on each departure from the United States of a vessel employed in the ocean mail service under the act, three-fourths of the crew, exclusive of licensed officers required by law, and exclusive of the steward's department, should be citizens of the United States. The modification insisted upon by the Senate conferees, to which the House conferees agreed, provides: (1) That all licensed officers of vessels documented under the laws of the United States as now required by law shall be citizens of the United States; (2) that from and after the enactment of the act and for a period of four years, upon each departure of a vessel employed in the ocean mail service under the act, one-half of the crew shall be citizens of the United States; and (3) that thereafter two-thirds of the crew shall be such citizens.

In section 406 of the House amendment two additional cities in which advertisements calling for bids for carrying the mails are required were added, Jacksonville on the east coast and Tacoma on the Pacific.

In paragraph (b) of section 408 of the House amendment, the word "registered" is stricken out and the word "documented" is substituted.

In section 601 of the House amendment, which appears as section 501 of the conference draft, the article "a" is eliminated and the word "fund" is changed to the plural, "funds."

Title V, providing for a merchant marine naval reserve, of the House amendment, is stricken from the bill.

In paragraph (b) of section 803 of the House amendment, which appears in the committee's draft as paragraph (b) of section 703, the words "a person owing allegiance to the United States, and" are stricken out.

Text of the Jones-White Bill

Conference Report

The committee of conference on the disagreeing votes of the two Houses on the amendment of the House to the bill (S.744) to further develop an American merchant marine, to assure its permanence in the transportation of the foreign trade of the United States, and for other purposes, having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses as follows:

That the Senate recede from its disagreement to the amendment of the House, and agree to the same with an amendment, as follows: In lieu of the matter proposed to be inserted by said amendment insert the following:

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Title I—Declaration of Policy

"SEC. 1. The policy and the primary purpose declared in section 1 of the merchant marine act, 1920 (U. S. C., title 46, sec. 861), are hereby confirmed.

Title II—Shipping Board Vessels
Sales By Board

"SEC. 201. The United States Shipping Board shall not sell any vessel or any line of vessels except when in its judgment the building up and maintenance of an adequate merchant marine can be best served thereby, and then only upon the affirmative vote of five members of the board duly recorded.

Remodeling and Improving

"SEC. 202. In addition to its power to recondition and repair vessels under section 12 of the merchant marine act, 1920, as amended (U. S. C., title 46, sec. 871), the board may remodel and improve vessels owned by the United States and in its possession or under its control, so as to equip them adequately for competition in the foreign trade of the United States. Any vessel so remodeled or improved shall be documented under the laws of the United States and shall remain documented under such laws for not less than five years from the date of the completion of the remodeling or improving and so long as there remains due the United States any money or interest on account of such vessel, and during such period it shall be operated only on voyages which are not exclusively coastwise.

Replacements

"SEC. 203. The necessity for the replacement of vessels owned by the United States and in the possession or under the control of the board and the construction for the board of additional up-to-date cargo, combination cargo and passenger, and passenger ships, to give the United States an adequate merchant marine, is hereby recognized, and the board is authorized and directed to present to Congress from time to time, recommendations setting forth what new vessels are required for permanent operation under the United States flag in foreign trade, and the estimated cost thereof, to the end that Congress may, from time to time, make provision for replacement and additions. All vessels built for the board shall be built in the United States, and they shall be planned with reference to their possible usefulness as auxiliaries to the naval and military services of the United States.

Title III—Construction Loan Fund
Terms and Conditions of Loans

"SEC. 301. (a) Section 11 of the merchant marine act, 1920, as amended (U. S. C. title 46, sec. 870; 44 Stat. L. pt. 2, 1451), is amended to read as follows:

"'SEC. 11. (a) That the board may set aside, out of the revenues from sales, including proceeds of securities consisting of notes, letters of credit, or other evidences of debt, taken by it for deferred payments on purchase money from sales by the board, whether such securities are to the order of the United States, the United States Shipping Board, the United States Shipping Board Emergency Fleet Corporation, or the United States Shipping Board Merchant Fleet Corporation, either directly or by indorsement, until the amounts thus set aside from time to time aggregate $125,000,000. The amount thus set aside shall be known as the construction loan fund. The board may use such fund to the extent it thinks proper, upon such terms as the board may prescribe, in making loans to aid persons citizens of the United States in the construction by them in private shipyards or navy yards in the United States of vessels of the best and most efficient type for the establishment or maintenance of service on lines deemed desirable or necessary by the board, provided such vessels shall be fitted and equipped with the most modern, the most efficient, and the most economical engines, machinery, and commercial appliances; or in the outfitting and equipment by them in private shipyards or navy yards in the United States of vessels already built, with engines, machinery, and commercial appliances of the type and kind mentioned; or in the reconditioning, remodeling, or improvement by them in private shipyards or navy yards in the United States of vessels already built.

"'(b) The term "vessel" or "vessels," where used in this section, shall be construed to mean a vessel or vessels to aid in whose construction, equipment, reconditioning, remodeling, or improvement, a loan is made from the construction loan fund of the board. All such vessels shall be documented under the laws of the United States and shall remain documented under such laws for not less than 20 years from the date the loan is made, and so long as there remains due the United States any principal or interest on account of such loan.

"'(c) No loan shall be made for a longer time than 20 years. If it is not to be repaid within two years from the date when the first advance on the loan is made by the board, the principal shall be payable in equal annual installments to be definitely prescribed in the instruments. The loan may be paid at any time, on 30 days' written notice to the board, with interest computed to date of payment.

"'(d) All such loans shall bear interest at rates as follows, payable not less frequently than annually: During any period in which the vessel is operated exclusively in coastwise trade, or is inactive, the rate of interest shall be as fixed by the board, but not less than 5¼ percent per annum. During any period in which the vessel is operated in foreign trade the rate shall be the lowest rate of yield (to the nearest one-eighth of 1 percent) of any Government obligation bearing a date of issue subsequent to April 6, 1917 (except postal-savings bonds), and outstanding at the time the loan is made by the board, as certified by the Secretary of the Treasury to the board upon its request. The board may prescribe rules for determining the amount of interest payable under the provisions of this paragraph.

"'(e) No loan shall be for a greater sum than three-fourths the cost of the vessel or vessels to be constructed or than three-fourths the cost of the reconditioning, remodeling, improving, or equipping hereinbefore authorized for a vessel already built.

"'(f) The board shall require such security as it shall deem necessary to insure the completion of the construction, reconditioning, remodeling, improving, or equipping of the vessel within a reasonable time and the repayment of the loan with interest; when the construction, reconditioning, remodeling, improving, or equipping of the vessel is completed the security shall include a preferred mortgage on the vessel, complying with the provisions of the ship mortgage act, 1920 (U. S. C., title 46, chap. 25), which mortgage shall contain appropriate covenants and provisions to insure the proper physical maintenance of the vessel, and its protection against liens for taxes, penalties, claims, or liabilities of any kind whatever, which might impair the security for the debt. It shall also contain any other covenants and provisions the board may prescribe, including a provision for the summary maturing of the entire debt, for causes to be enumerated in the mortgage.

"'(g) The board shall also require and the security furnished shall provide that the owner of the vessel shall keep the same insured against loss or damage by fire, and against marine risks and disasters, and against any and all other insurable risks the board specifies, with such insurance companies, associations, or underwriters, and under such forms of policies, and to such an amount, as the board may prescribe or approve; such insurance shall be made payable to the board and/or to the parties, as interest may appear. The board is authorized to enter into any agreement that it deems wise in respect to the payment and for the guaranty of premiums of insurance.'

"(b) Section 11 of the merchant marine act, 1920, as in force immediately prior to the enactment of this act, shall remain in force in respect of all loans made before the enactment of this act.

Increase of Construction Loan Fund

"SEC. 302. (a) There is authorized to be appropriated, to be credited to and for the purposes of the construction loan fund created by section 11 of the merchant marine act, 1920, as amended, such amounts as will, when added to the amounts credited to such fund by the United States Shipping Board under authority of law (exclusive of repayments on loans from the fund), make the aggregate of the amounts credited to such fund (exclusive of such repayments) equal to $250,000,000.

"(b) When $250,000,000 has been credited to such fund (whether by the board under authority of law or from appropriations authorized by this section, but exclusive of repayments on loans from the fund) then no further sums (except such repayments) shall be credited by the board to such fund.

"(c) The construction loan fund shall continue to be a revolving fund. Repayments on loans from the fund shall be credited to the fund, but interest on such loans shall be covered into the Treasury as miscellaneous receipts.

Title IV—Ocean Mail Service
Scope of Title

"SEC. 401. All mails of the United States carried on vessels between ports (exclusive of ports in the Dominion of Canada other than ports in Nova Scotia) between which it is lawful under the navigation laws for a vessel not documented under the laws of the United States to carry merchandise shall, if practicable, be carried on vessels in respect of which a contract is made under this title.

Requirements of Postal Service

"SEC. 402. As soon as practicable after the enactment of this act, and from time to time thereafter, it shall be the duty of the Postmaster General to certify to the United States Shipping Board what ocean mail routes, in his opinion, should be established and/or operated for the carrying of mails of the United

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States between ports (exclusive of ports in the Dominion of Canada other than ports in Nova Scotia) between which it is lawful under the navigation laws for a vessel not documented under the laws of the United States to carry merchandise, distributed so as equitably to serve the Atlantic, Mexican Gulf, and Pacific coast ports, the volume of mail then moving over such routes and the estimated volume thereof during the next five years, the times deemed by him advisable for the departure of the vessels carrying such mails, and other requirements necessary to provide an adequate postal service between such ports.

Recommendations by Shipping Board

"SEC. 403. The board shall, as soon as practicable after receipt of such certification from the Postmaster General, determine and certify to him the type, size, speed, and other characteristics of the vessels which should be employed on each such route, the frequency and regularity of their sailings, and all other facts which bear upon the capacty of the vessels to meet the requirements of the service stated by the Postmaster General. The board in making its determination shall take into consideration the desirability of having the mail service performed by vessels constructed in accordance with the latest and most approved types, with modern improvements and appliances.

Authority to Make Contracts

"SEC. 404. The Postmaster General is authorized to enter into contracts with citizens of the United States whose bids are accepted, for the carrying of mails between ports (exclusive of ports in the Dominion of Canada other than ports in Nova Scotia) between which it is lawful under the navigation laws for a vessel not documented under the laws of the United States to carry merchandise. He shall include in such contracts such requirements and conditions as in his best judgment will insure the full and efficient performance thereof and the protection of the interests of the Government. Performance under any such contract shall begin not more than three years after the contract is let, and the term of the contract shall not exceed 10 years.

Vessels

"SEC. 405 (a) The vessels employed in ocean-mail service under a contract made under this title shall be steel vessels, shall be steam or motor vessels, and shall be either (1) American-built and registered under the laws of the United States during the entire time of such employment, or (2) registered under the laws of the United States not later than February 1, 1928, and so registered during the entire time of such employment, or (3) actually ordered and under construction for the account of citizens of the United States prior to February 1, 1928, and registered under the laws of the United States during the entire time of such employment.

"(b) A vessel for the services of which a contract is entered into under authority of this title, and the construction of which is hereafter begun, shall be either (1) a vessel constructed according to plans and specifications approved by the Secretary of the Navy, with particular reference to economical conversion into an auxiliary naval vessel, or (2) a vessel which will be otherwise useful to the United States in time of national emergency.

"(c) From and after the enactment of this act, all licensed officers of vessels documented under the laws of the United States, as now required by law, shall be citizens of the United States; from and after the enactment of this act and for a period of four years, upon each departure from the United States of a vessel employed in ocean-mail service under this title, one-half of the crew (crew including all employees of the ship other than officers) shall be citizens of the United States and, thereafter, two-thirds of the crew as above defined shall be citizens of the United States.

Advertising for Bids

"SEC. 406. Before making any contract for carrying ocean mails under this title the Postmaster General shall give public notice by advertisement once a week for three weeks in such daily newspapers as he shall select in each of the cities of Boston, New York, Philadelphia, Baltimore, New Orleans, Charleston, Norfolk, Savannah, Jacksonville, Galveston, Houston, and Mobile, calling for bids for carrying of such ocean mails; or when the proposed service is to be on the Pacific Ocean then in Los Angeles, San Francisco, Portland, Tacoma, and Seattle. Such notice shall describe the proposed route, the time when such contract will be made, the number of trips a year, the schedule required, the time when the service shall commence, the character of the vessels required, and all other information deemed by the Postmaster General to be necessary to inform prospective bidders as to the character of the service to be required.

Awarding Contracts

"SEC. 407. Each contract for the carrying of ocean mails under this title shall be awarded to the lowest bidder who, in the judgment of the Postmaster General, possesses such qualifications as to insure proper performance of the mail service under the contract.

Classification of Vessels

"SEC. 408. (a) The vessels employed in ocean mail service under this title shall be divided into classes as follows:

"Class 7. Vessels capable of maintaing a speed of 10 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 2,500 tons.

"Class 6. Vessels capable of maintaining a speed of 10 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 4,000 tons.

"Class 5. Vessels capable of maintaining a speed of 13 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 8,000 tons.

"Class 4. Vessels capable of maintaininng a speed of 16 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 10,000 tons.

"Class 3. Vessels capable of maintaining a speed of 18 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 12,000 tons.

"Class 2. Vessels capable of maintaining a speed of 20 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 16,000 tons.

"Class 1. Vessels capable of maintaining a speed of 24 knots at sea in ordinary weather, and of a gross registered tonnage of not less than 20,000 tons.

"(b) The classification of a vessel may be based upon its speed without regard to its tonnage if the Postmaster General is of opinion that speed is especially important on the particular route on which the vessel is to be employed and that a suitable vessel documented under the laws of the United States of a higher classification is not available on reasonable terms and conditions, or, on account of the character of the ports served or for other reasons, can not be safely or economically employed on such route.

Compensation Under Contracts

"SEC. 409. (a) The rate of compensation to be paid under this title for ocean-mail service shall be fixed in the contract. Such rate shall not exceed: For vesseles of class 7, $1.50 per nautical mile; for vessels of class 6, $2.50 per nautical mile; for vessels of class 5, $4 per nautical mile; for vessels of class 4, $6 per nautical mile; for vessels of class 3, $8 per nautical mile; for vessels of class 2, $10 per nautical mile; and for vessels of class 1, $12 per nautical mile. As used in this section the term 'nautical mile' means 6,080 feet.

"(b) When the Postmaster General is of opinion that the interests of the Postal Service will be served thereby, he may, in the case of a vessel of class 1 capable of maintaining a speed in excess of 24 knots at sea in ordinary weather, contract for the payment of compensation in excess of the maximum compensation authorized in subsection (a), but the compensation per nautical mile authorized by this subsection shall not be greater than an amount which bears the same ratio to $12 as the speed which such vessel is capable of maintaining at sea in ordinary weather bears to 24 knots.

"(c) If the Postmaster General is of opinion that to expedite and maintain satisfactory service under a contract made under this title, airplanes or airships are required to be used in conjunction with vessels, he may allow additional compensation, in amounts to be determined by him, on account of the use of such airplanes or airships. Such airplanes or airships shall be American-built and owned, officered, and manned by citizens of the United States.

"(d) The Postmaster General shall determine the number of nautical miles by the shortest practicable route between the ports involved and payments under any contract made under this title shall be made for such number of miles on each outward voyage regardless of the actual mileage traveled.

Violation of Contracts

"SEC. 410. In the case of failure of a vessel from any cause to perform any regular voyage required by a contract made under this title, a pro rata deduction shall be made from the contract price on account of such omitted voyage; and suitable deductions, to be determined by the Postmaster General, may be made from the compensation payable under the contract for delays, failure to properly safeguard the mails, or other irregularities in the performance of the contract. Deductions so determined upon shall be deducted by the Postmaster General from the payments otherwise due and payable under the terms of the contract. The Postmaster General may, in case of emergency, permit the substitution for a particular voyage of a vessel not within the provisions of the contract, even though not conforming to the requirements of section 405.

Passengers, Freight and Express

"SEC. 411. Any vessel operating under a contract made under

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this title may carry passengers and their baggage, and freight and express, and may do all ordinary business done by similar vessels.

Naval Officers

"SEC. 412. Naval officers of the United States on the active list may volunteer for service on any vessel employed in mail service under a contract made under the provisions of this title, and when accepted by the owner or master thereof may be assigned to such duty by the Secretary of the Navy. While in such employment such officers shall receive from the Government half pay, exclusive of allowances, and such other compensation from the owner or master as may be agreed upon by the parties; but such officers while in such employment shall be required to perform only such duties as appertain to the merchant marine.

Mail Messengers

"SEC. 413. Upon each vessel employed in ocean mail service under a contract made under this title, the Postmaster General shall be entitled to have transported such mail messengers as he may require, for whom shall be provided subsistence, suitable staterooms, and working quarters, all free of charge.

Amendments and Repeals

"SEC. 414. (a) Section 24 of the merchant marine act, 1920 (U. S. C., title 46, sec. 880), is amended to read as follows:

"'SEC. 24. That all mails of the United States shipped or carried on vessels shall, if practicable, be shipped or carried on American-built vessels documented under the laws of the United States. No contract hereafter made with the Postmaster General for carrying mails on vessels so built and documented shall be assigned or sublet, and no mails covered by such contract shall be carried on any vessel not so built and documented. No money shall be paid out of the Treasury of the United States on or in relation to any such contract for carying mails on vessels so built and documented when such contract has been assigned or sublet or when mails covered by such contract are in violation of the terms thereof carried on any vessel not so built and documented. This section shall not be applicable in the case of contracts made under Title IV of the merchant marine act, 1928.'

"(b) Section 7 of the merchant marine act, 1920 (U. S. C., title 46, sec. 866), is amended by striking out so much thereof as reads as follows: 'The Postmaster General is authorized, notwithstanding the act entitled "An act to provide for ocean mail service between the United States and foreign ports, and to promote commerce," approved March 3, 1891, to contract for the carrying of the mails over such lines at such price as may be agreed upon by the board and the Postmaster General.'

"(c) The act entitled 'An act to provide for ocean mail service between the United States and foreign ports, and to promote commerce,' approved March 3, 1891 (U. S. C., title 39, secs. 657-665), is repealed.

"(d) So much of the act entitled 'An act making appropriations for the service of the Post Office Department for the fiscal year ending June 30, 1918, and for other purposes,' approved March 3, 1917, as provides for contracts for the carrying of mails between the United States and Great Britain (U. S. C., title 39, sec. 666), is repealed.

"(e) Subdivision (b) of section 4009 of the Revised Statutes, as amended (44 Stat. L., pt. 2,900), is amended to read as follows:

"'(b) The provisions of subdivision (a) of this section shall not limit the compensation for transportation of mail which the Postmaster General may pay under contracts entered into in accordance with the provisions of section 4007 of the Revised Statutes (U. S. C., title 39, sec. 652), section 24 of the merchant marine act, 1920 (U. S. C., title 46, sec. 880), or title 4 of the merchant marine act, 1928.'

"(f) Any contract made prior to the enactment of this act shall remain in force and effect in the same manner and to the same extent as though this act had not been enacted. Any such contract which expires on June 30, 1928, may be extended for a period of not more than one year from such date.

Title V—Insurance Fund

"SEC. 501. Section 10 of the merchant marine act, 1920 (U. S. C., title 46, sec. 869), is amended to read as follows:

"'SEC. 10. That the board may create out of insurance premiums, and revenue from operations and sales, and maintain and administer separate insurance funds which it may use to insure in whole or in part against all hazards commonly covered by insurance policies in such cases, any legal or equitable interest of the United States (1) in any vessel constructed or in process of construction; and (2) in any plants or property in the possession or under the authority of the board. The United States shall be held to have such an interest in any vessel toward the construction, reconditioning, remodeling, improving, or equipping of which a loan has been made under the authority of this act, in any vessel upon which it holds a mortgage or lien of any character, or in any vessel which is obligated by contract with the owner to perform any service in behalf of the United States, to the extent of the Government's interest therein.'

Title VI—Transportation of Government Officials

"SEC. 601. Any officer or employee of the United States traveling on official business overseas to foreign countries, or to any of the possessions of the United States, shall travel and transport his personal effects on ships registered under the laws of the United States when such ships are available, unless the necessity of his mission requires the use of a ship under a foreign flag: *Provided*, That the Comptroller General of the United States shall not credit any allowance for travel or shipping expenses incurred on a foreign ship in the absence of satisfactory proof of the necessity therefor.

Title VII—Miscellaneous

Authorization of Appropriations

"SEC. 701. The appropriations necessary to carry out the provisions and accomplish the purposes of this act are hereby authorized.

Requisition of Vessels

"SEC. 702. (a) The following vessels may be taken and purchased or used by the United States for national defense or during any national emergency declared by proclamation of the President:

"(1) Any vessel in respect of which, under a contract hereafter entered into, a loan is made from the construction loan fund created by section 11 of the merchant marine act, 1920, as amended—at any time until the principal and interest of the loan has been paid; and

"(2) Any vessel in respect of which an ocean mail contract is made under title 4 of this act—at any time during the period for which the contract is made.

"(b) In such event the owner shall be paid the fair actual value of the vessel at the time of taking, or paid the fair compensation for her use based upon such fair actual value; but in neither case shall such fair actual value be enhanced by the causes necessitating the taking. In the case of a vessel taken and used, but not purchased, the vessel shall be restored to the owner in a condition at least as good as when taken, less reasonable wear and tear, or the owner shall be paid an amount for reconditioning sufficient to place the vessel in such condition. The owner shall not be paid for any consequential damages arising from such taking and purchase or use.

"(c) The President shall ascertain the fair compensation for such taking and purchase or use and shall certify to Congress the amount so found by him to be due, for appropriation and payment to the person entitled thereto. If the amount found by the President to be due is unsatisfactory to the person entitled thereto, such person shall be entitled to sue the United States for the amount of such fair compensation and such suit shall be brought in the manner provided by paragraph 20 of section 24 or by section 145 of the Judicial Code, as amended (U. S. C., title 28, secs. 41, 250.)

Definitions

"SEC. 703. (a) When used in this act, and for the purposes of this act only, the words "foreign trade" mean trade between the United States, its Territories or possessions, or the District of Columbia and a foreign country: *Provided, however*, That the loading or the unloading of cargo, mail, or passengers at any port in any Territory or possession of the United States shall be construed to be foreign trade if the stop at such Territory or possession is an intermediate stop on what would otherwise be a voyage in foreign trade.

"(b) When used in this act the term "citizen of the United States" includes a corporation, partnership, or association only if it is a citizen of the United States within the meaning of section 2 of the shipping act, 1916, as amended (U. S. C., title 46, sec. 802).

Reaffirmation of Policy

"SEC. 704. The policy and the primary purpose declared in section 7 of the Merchant Marine Act, 1920 (U. S. C., title 46, sec. 866), are hereby reaffirmed.

Ship Operations

"SEC. 705. In the allocations of the operations of the ships, the Shipping Board shall distribute them as far as possible and without detriment to the service among the various ports of the country.

Short Title

"SEC. 706. This act may be cited as the 'Merchant marine act, 1928.'"

Two New Commissioners Appointed

Further indications of the President's desire to carry out a policy of disposing of Shipping Board vessels as rapidly as possible to private operators are seen in his appointment of two commissioners of the

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Shipping Board to succeed Admiral William S. Benson and Philip S. Teller, who have favored a policy of extreme reluctance to dispose of the ships on the terms that have been offered so far. Rear Admiral H. I. Cone, who was vice-president of the Emergency Fleet Corporation during 1924 and 1925, was appointed for a new term to succeed Admiral Benson, upon the expiration of his term, on June 8, and the appointment was confirmed by the Senate on May 19. Samuel S. Sandberg, manager of the Los Angeles harbor and formerly marine superintendent of the Luckenbach Steamship Company, was also appointed for a term of six years from June 9, succeeding Mr. Teller.

Admiral Benson has been consistent in favoring the maintenance of a government fleet and Commissioner Teller has favored placing restrictive conditions on the sales of ships. President Coolidge on several occasions in commenting on the marine bill as passed by the Senate and later amended by the House has indicated opposition to the provision of the Jones bill which would have required a unanimous vote of the commissioners to sell ships and also to the modified provision inserted in its place in the House which requires a vote only of five out of seven commissioners. It has been pointed out on behalf of the President that this would enable two commissioners to control the action of the board.

Adverse Report on Transoceanic Proposal

Chairman O'Connor, of the Shipping Board, on April 24 sent to the Senate an unfavorable report on the proposal of the Transoceanic Corporation to construct and operate six fast passenger vessels, with the aid of a government loan, describing the project as "technically open to criticism, economically unsound, and financially nebulous." The report was submitted in response to a resolution adopted by the Senate at the suggestion of Senator Bingham. The report includes 57 printed pages, including correspondence between officers of the company and Admiral Benson, who was placed in charge of the investigation by the board for the purpose of reporting to the Senate.

The conclusions of the board are recapitulated and the inquiries contained in Senate Resolution No. 125 are answered as follows:

(1) The plans of the vessel submitted are inadequate and incomplete. No margin has been allowed either with respect to power required or the strength of the vessel. The estimated total weight of the vessel as projected is insufficient considering its size and power and the necessary weight of fuel, water, and stores, as well as that of mails and cargo to be carried. The vessels projected will not be able to maintain a sea speed of 33 knots on the power contemplated. The cost of the vessels will be in excess of the estimate submitted, since the size must be increased and since the original estimate was too low.

(2) The Transoceanic Corporation has declined to submit any data with respect to its financial condition or its plans for future financing. An analysis of the expected revenues and expenses disclose that the figures presented by the Transoceanic Corporation are incorrect and that the revenues are much smaller and the expenses much greater than anticipated by the corporation. The board regards the financial standing of the Transoceanic Corporation and its plans for future financing as nebulous.

(3) The Transoceanic Corporation was incorporated January, 1928, under the laws of the State of Delaware.

(4) The minimum estimated cost of $153,180,000 for the six ships, including interest during construction, is considerably greater than suggested by the Transoceanic Corporation, and it is believed that this larger figure will be materially increased.

(5) Should the United States Government make a loan, the amount required would be 75 percent of the value of the six ships to be built, or a minimum sum of $108,000,000, at a low rate of interest, in accord with existing current Government borrowing rates, and, in addition, will be required to give a minimum annual mail compensation to the corporation in respect to the six vessels of $24,609,842, which is considered excessive.

(6) In view of the above facts found by the board, it is recommended that the so-called proposal of the Transoceanic Corporation should not be accepted. The board makes this decision and recommendation without prejudice to the recommendations which it has made in the past, and which it may make in the future, urging the building up of the trans-Atlantic express passenger and mail service on sound economic lines, and is prepared to suggest to the Senate how this can be accomplished.

Navy Building Program Held Up in Senate

As this issue goes to press, although a few days remain before the adjournment of Congress, the indications are that the administration naval building program, after having been greatly reduced in the House, will have failed of action in the Senate. As passed by the House the bill provided only for the construction of 15 cruisers, at a cost of $17,000,000 each, and one aircraft carrier, at a cost of $19,000,000, a total of $274,000,000, as compared with an original program of over $700,000,000. The bill was taken up on April 27 by the Senate committee on naval affairs, which recommended the amended building program as adopted by the House, but by that time the bill had encountered the usual end-of-the-session jam in the Senate, which has not been particularly active in legislative matters at this session.

Senator Hale, of Maine, chairman of the naval affairs committee, addressed the Senate on the bill on May 18, during the debate on the tax reduction bill, and expressed great regret that the parliamentary situation was such that he had not been able to bring the bill before the Senate for a vote. He said that in his opinion not 20 Senators are opposed to the passage of the bill and that the session should not be brought to a close without action on it.

"Failure to pass this bill, with its moderate program of construction," he said, "at this session of Congress will result in real harm to our Navy. It will postpone the bringing up of our Navy, in a class of ships in which we are manifestly deficient, to a condition of efficiency. It will encourage the pacifists and the propagandists within and without the country, whose purpose it is to hamper and destroy our naval power. It will indicate to the rest of the world that we do not purpose to keep up our navy to the ratio strength of the Washington treaty, and thereby will weaken our position in any future attempt to reduce naval armament."

Load Line Bill Passed by the Senate

The Senate on May 2 passed, with practically no debate, the bill S. 1781 to establish load lines for American vessels in the foreign trade of over 250 tons.

* * *

The hearing before the Shipping Board on the petition of the Maritime Association of the Boston Chamber of Commerce for a readjustment of the ocean rate structure between Atlantic ports of the United States and Northern Europe so as to place through rates from interior points via Boston on a parity with those through Philadelphia and Canadian ports, will be begun on July 9 instead of June 6, as had previously been announced. Postponement of the date was approved by the Shipping Board on May 18 at the request of interested parties.

The Shipping Board on May 18 approved a conference rate agreement filed with it in compliance with Section 15 of the Shipping Act between common carriers by water in the trade between Atlantic and Gulf ports of the United States and Porto Rico.

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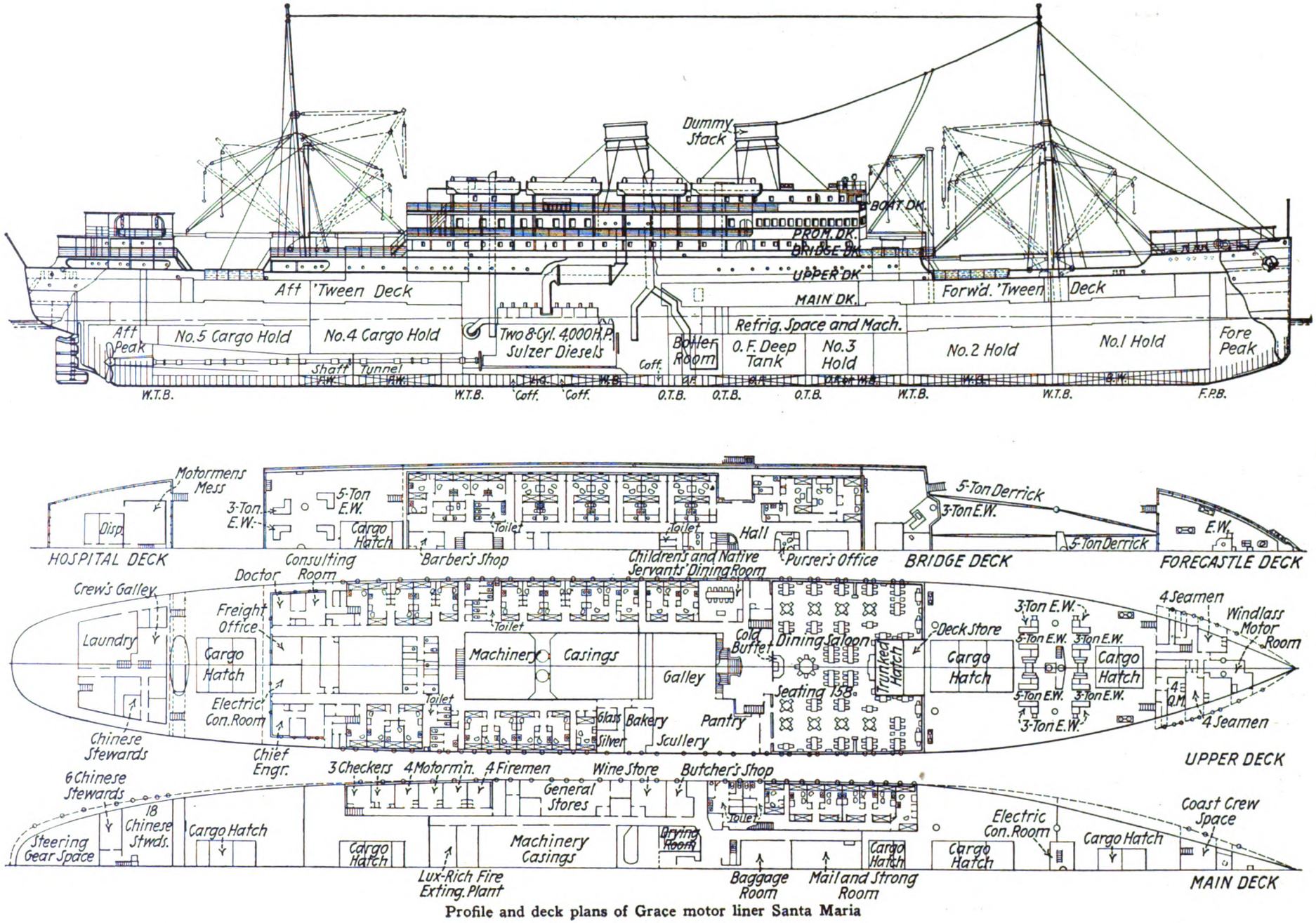

Profile and deck plans of Grace motor liner Santa Maria

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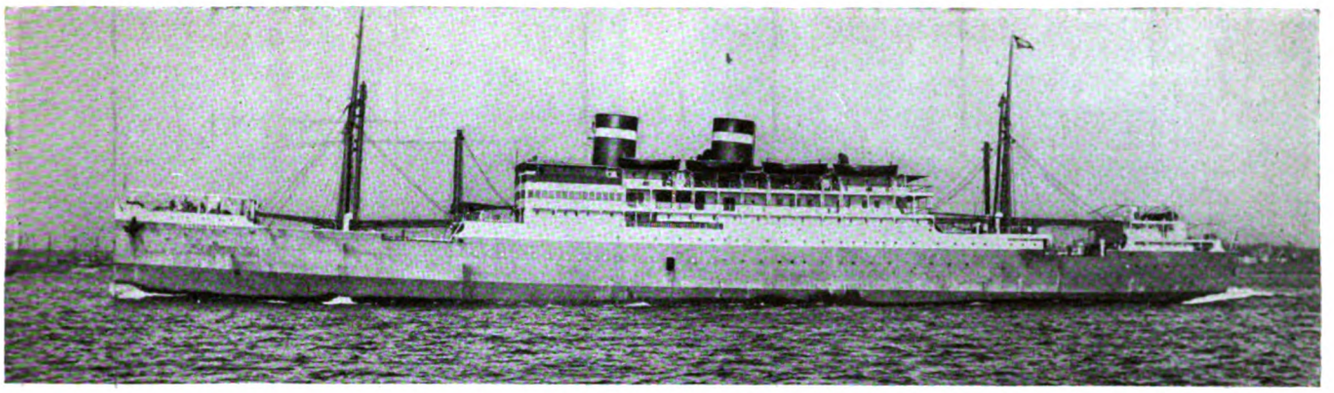


Twin-screw motor liner Santa Maria, built for the Grace L ine by the Furness Shipbuilding Company, Ltd.

Grace Line Motor Liner Santa Maria

First of two 16½-knot passenger and cargo vessels delivered by Furness Shipbuilding Company

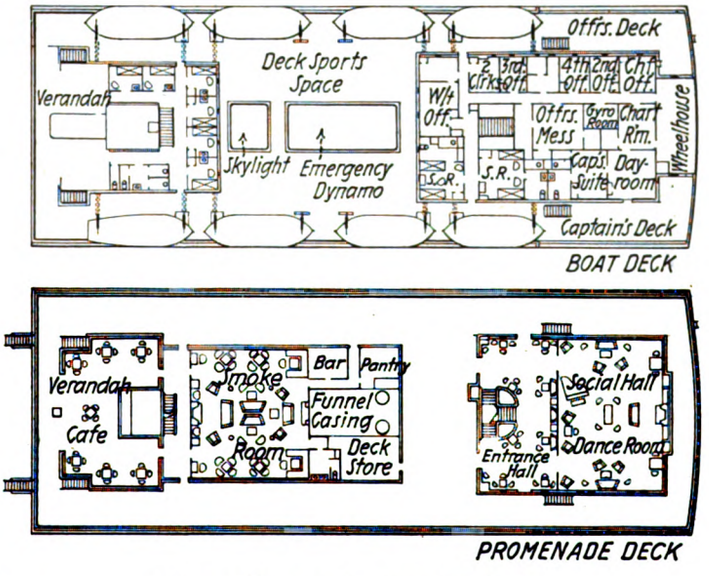
By Our London Correspondent

IT is well-known that there has been a revival of shipbuilding in the United Kingdom during the last six or nine months, but at the time the order was placed by the Grace Line, Inc., New York, with the Furness Shipbuilding Company for two large motor passenger and cargo liners for their service to the West Coast of South America, conditions were very depressed in the British shipbuilding industry, and it is probable that, were a similar contract placed today, the cost would be distinctly higher.

There was considerable competition among both European and British shipowners for this order, and it is worthy of remark that the *Santa Maria* and *Santa Barbara* will be two of the most important oil-engined craft turned out from a British yard in 1928. The *Santa Maria* ran her trials in April and it is anticipated that the *Santa Barbara* will be completed within the near future as she was launched last December.

The builders are the Furness Shipbuilding Company, which, incidentally, is one of the busiest English yards at the present time, having on order a number of tankers for American ownership as well as several vessels for British concerns, practically all to be equipped with internal-combustion machinery. The engines of the *Santa Maria* were, however, supplied direct by Sulzers from their Swiss works. They are of the 8-cylinder, 2-stroke cycle, single-acting type, each designed to develop 4,000 brake horsepower at 100 revolutions per minute.

The *Santa Maria* and her sister ship are 486 feet overall, the beam being 64 feet, and the gross tonnage slightly over 9,000. The normal draft has been kept down to the moderate figure of 25 feet, no doubt on account of the limitations of certain South American harbors, and in addition to carrying 150 to 160 passengers in one class, the *Santa Maria* has a deadweight capacity of approximately 7,000 tons of cargo. It was demanded that she should be able to average 16½ knots in a fully laden condition, and during the course of the trials this figure was considerably exceeded.



Plans of boat and promenade decks

Following what is now almost a fashion for motor liners, two funnels are provided, although of course they are by no means essential. One of the features of the ship is that the number of cabins with bathrooms adjoining represents a far bigger proportion than is usually to be found in passenger vessels. It would almost seem as if some shipowners, like hotel proprietors, are coming to the conclusion that what the public now demands is sleeping accommodation with adjoining bathrooms, and the additional expenditure is, no doubt, well warranted. Several suites de luxe are also incor-

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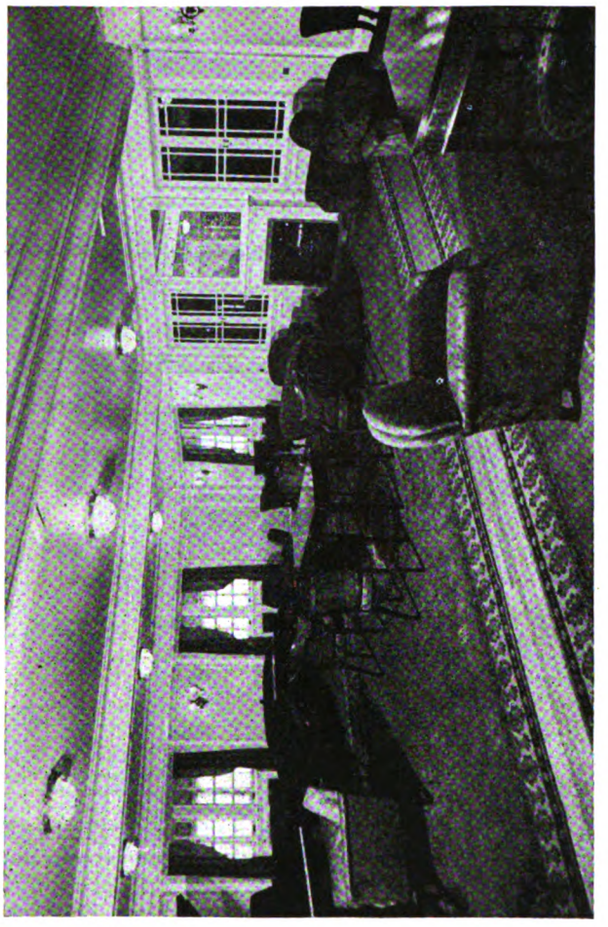
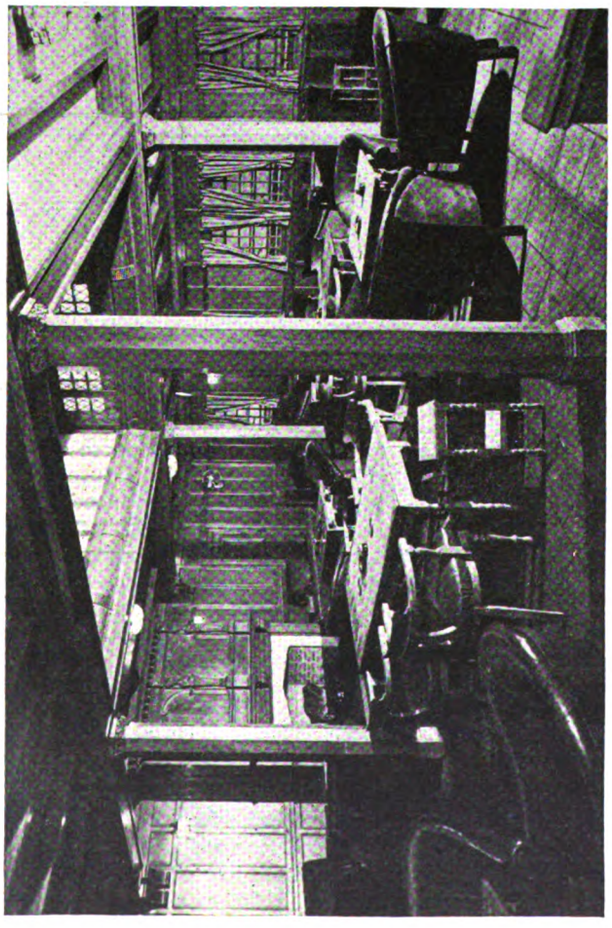
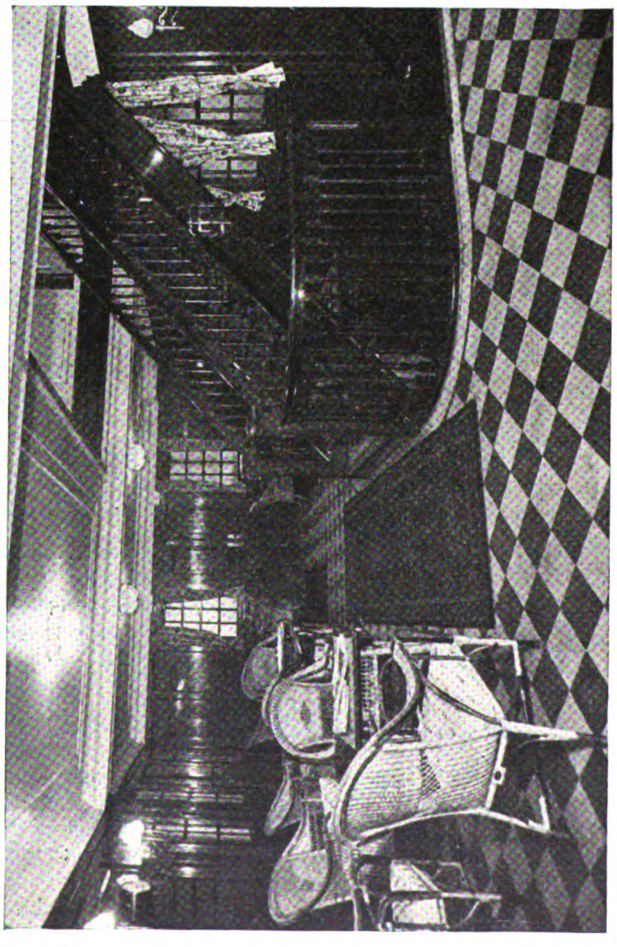


Social hall

Dining room



Smoking room



Foyer

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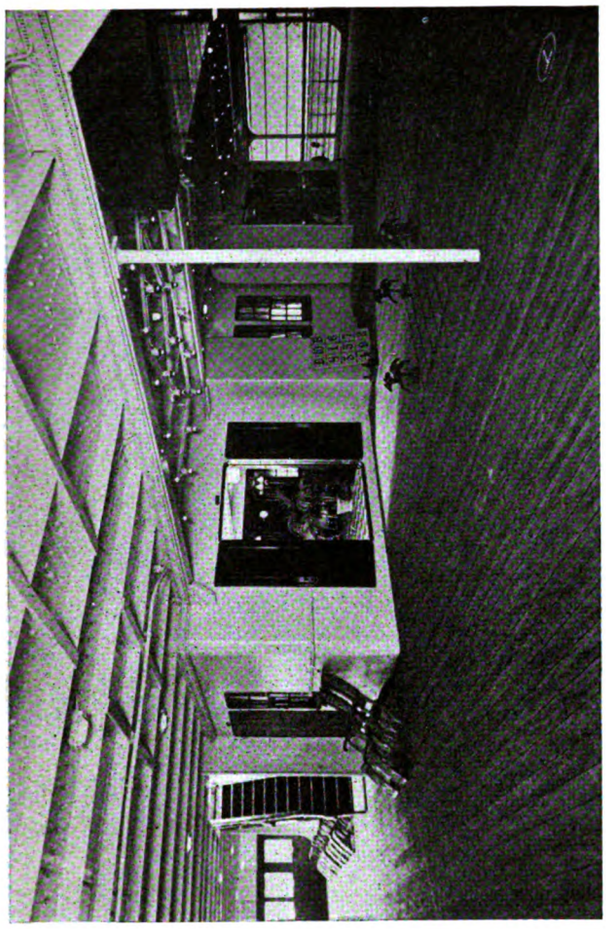
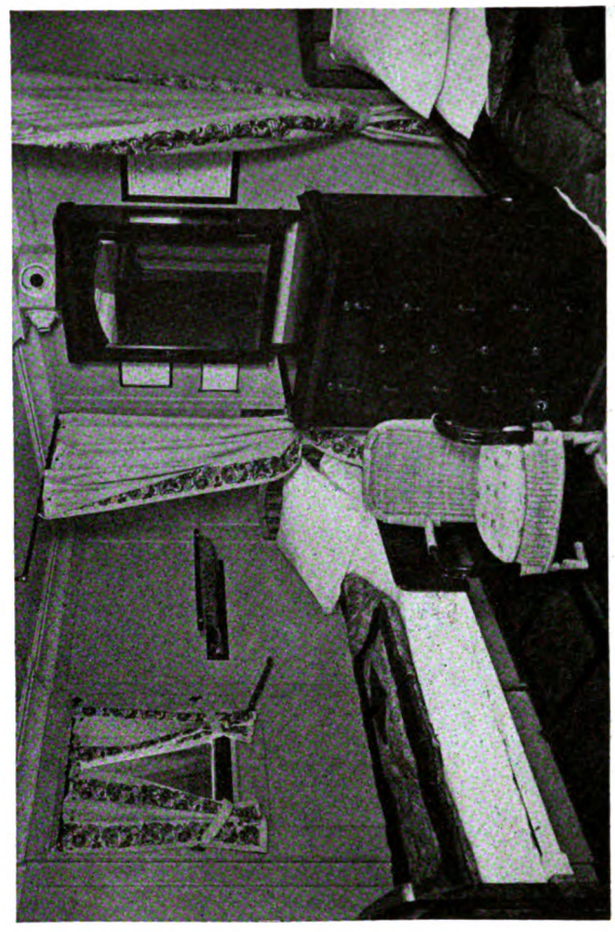
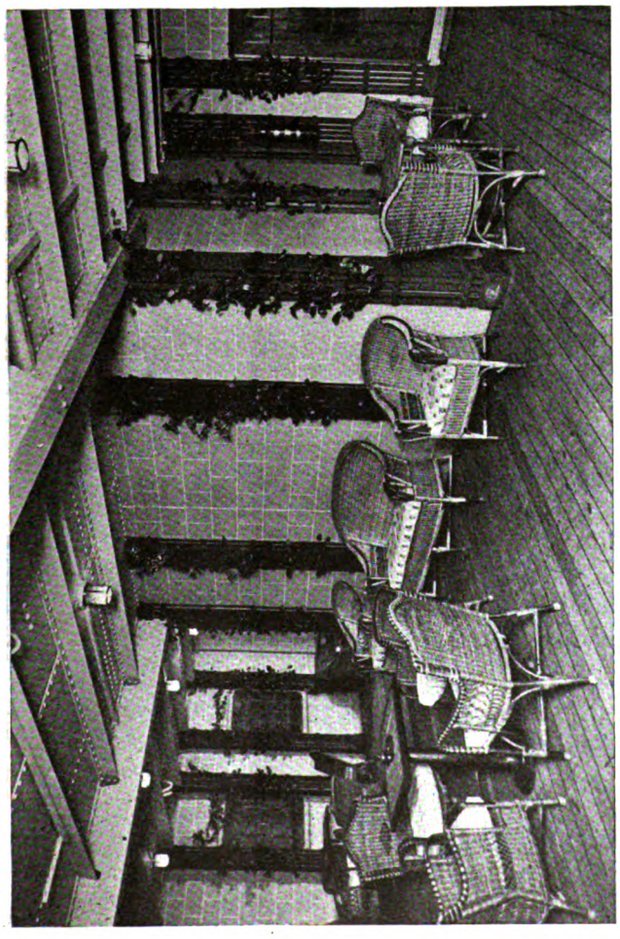


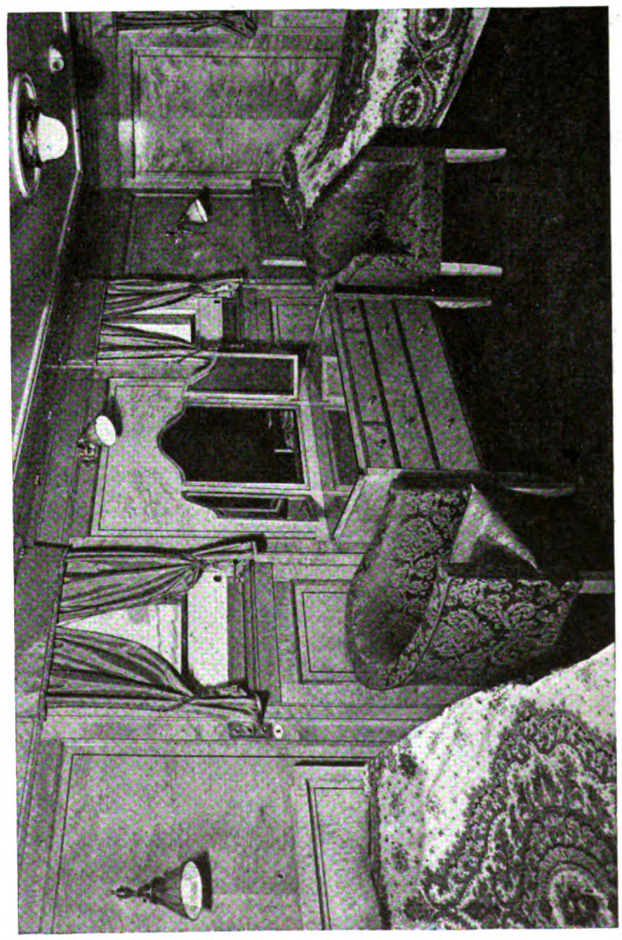
Recreation deck



Stateroom



Veranda cafe



De luxe stateroom

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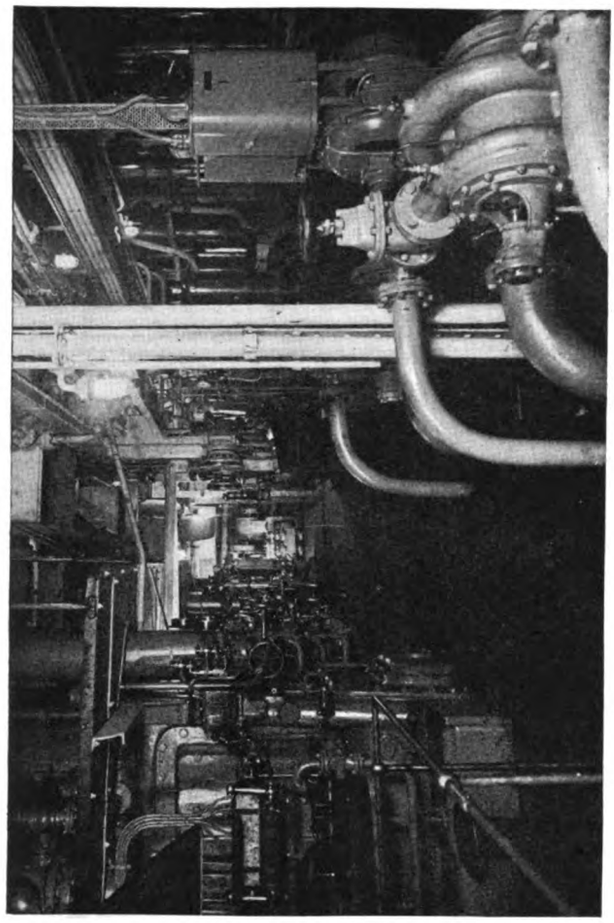
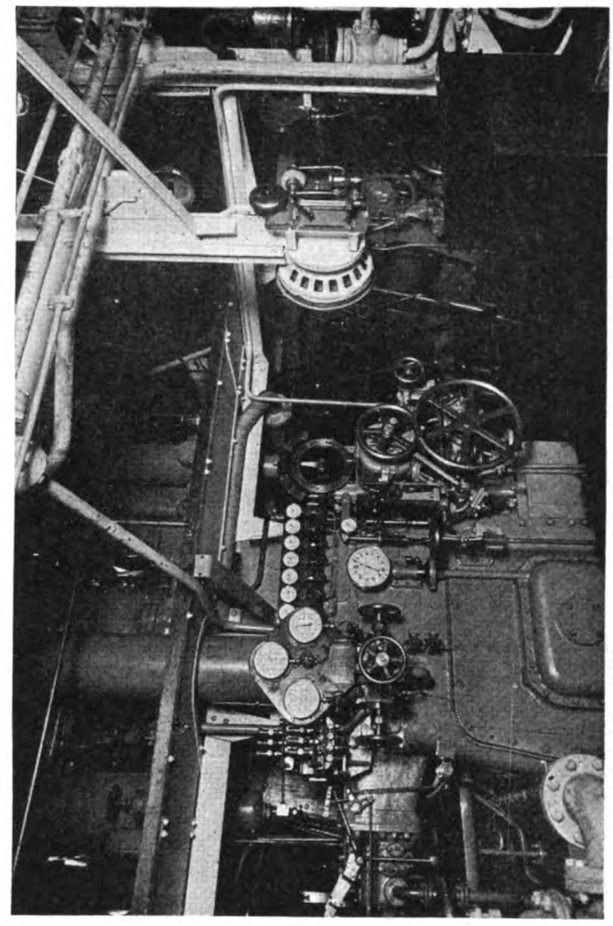
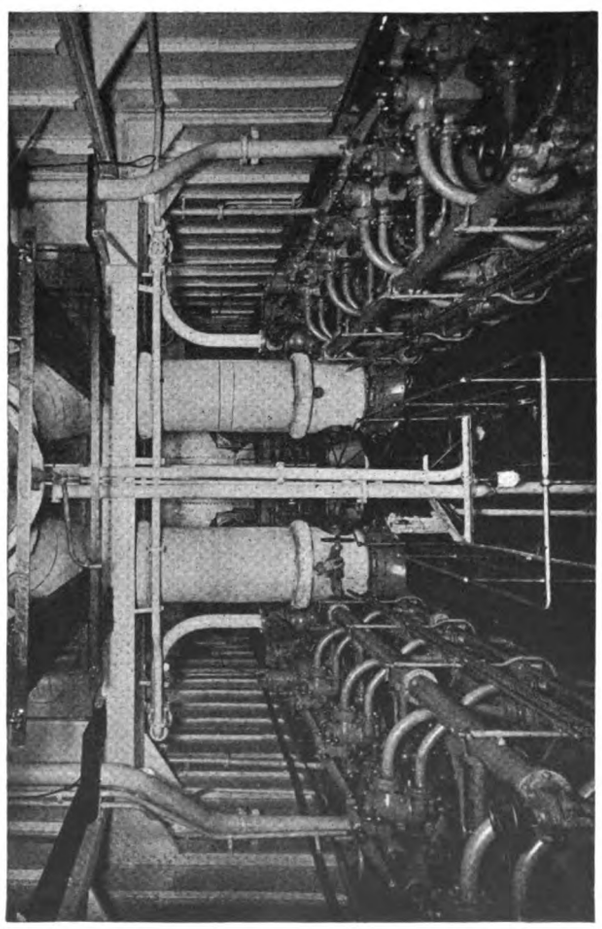


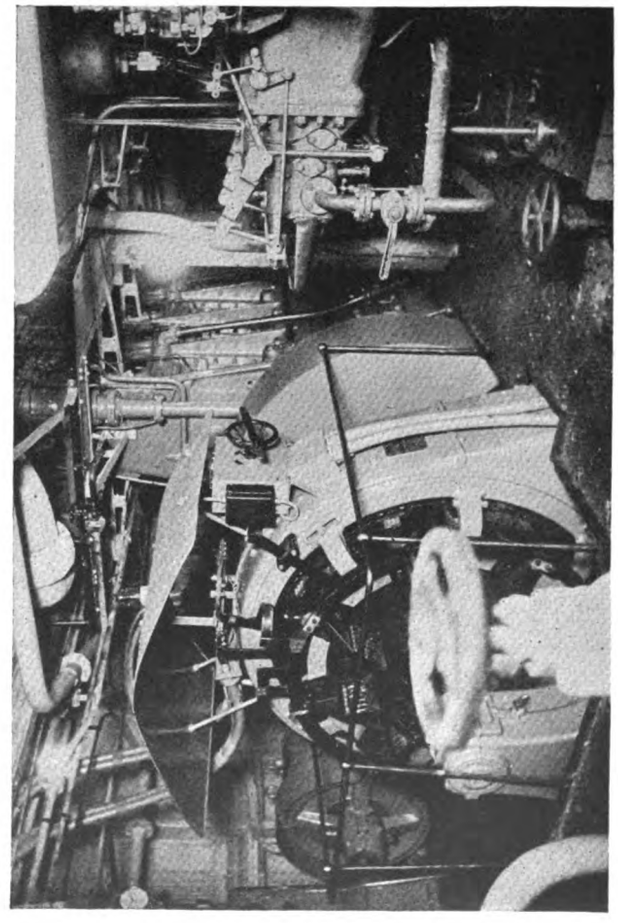
Forward end of engine room, looking to port



Maneuvering station of starboard main engine



Tops of main engines



270-kilowatt generator set

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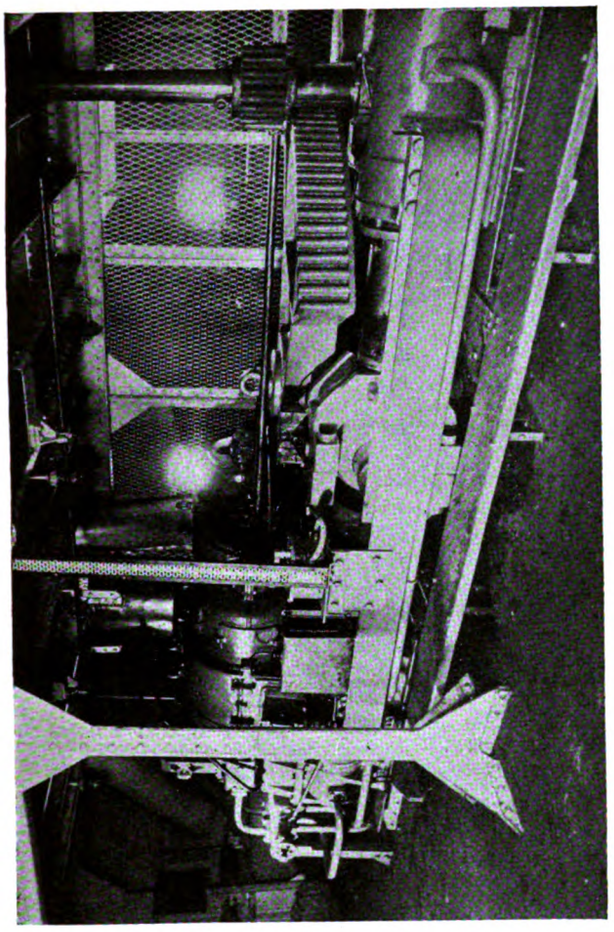
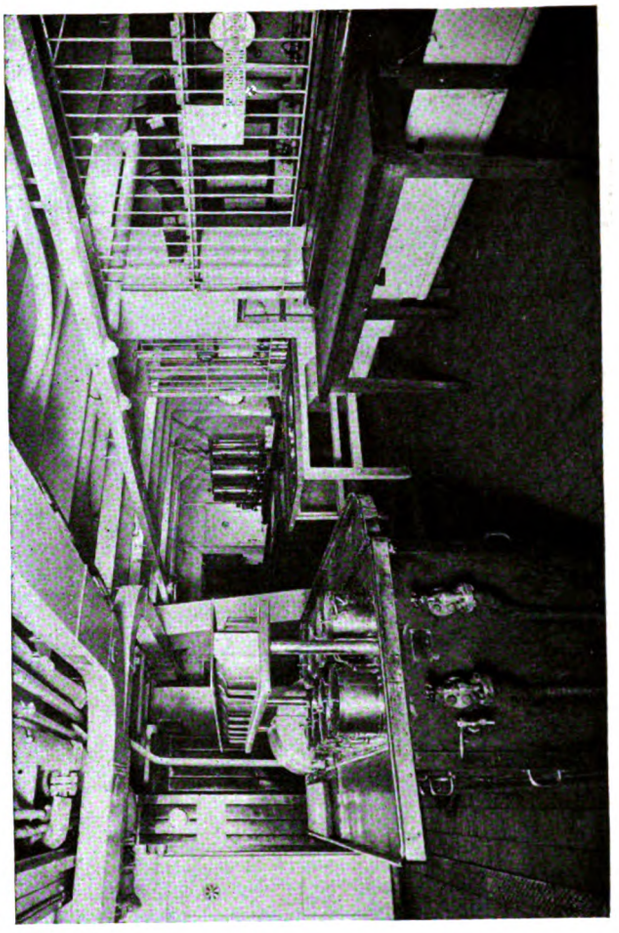
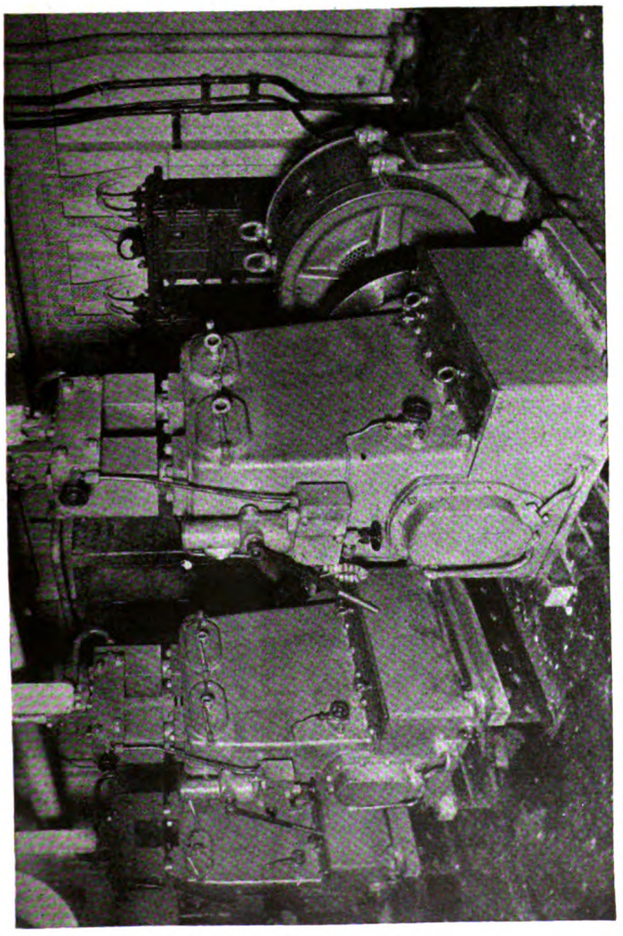


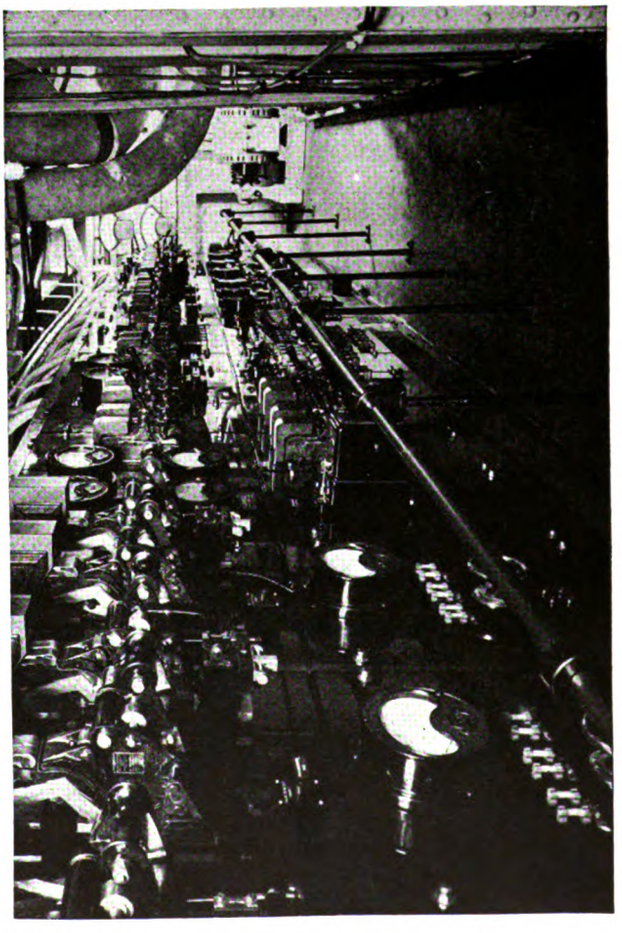
Steering gear



Galley



Refrigerating compressors



Switchboard

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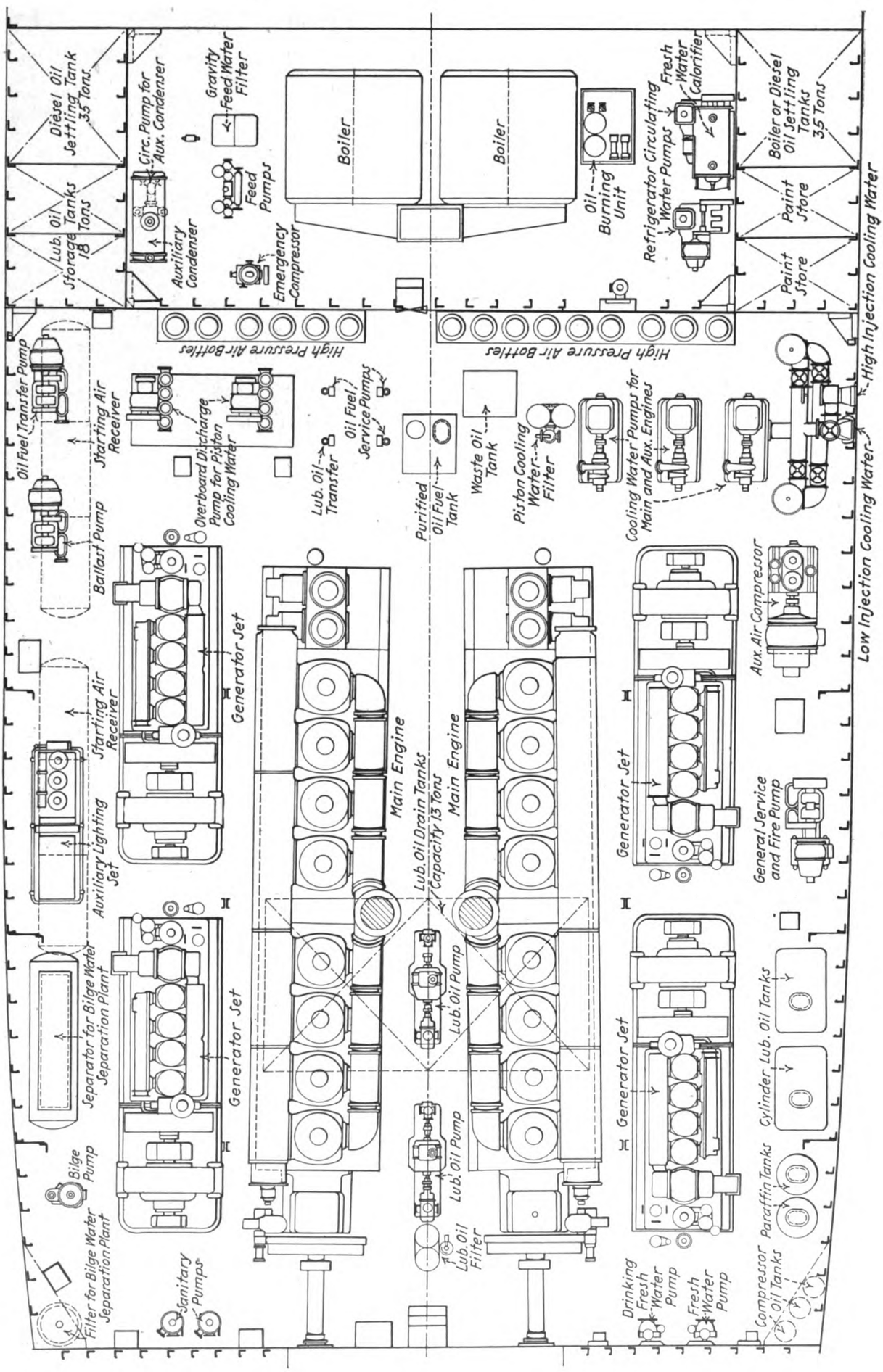

Engine room plan of M. S. Santa Maria

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porated in the accommodation, comprising a sleeping cabin, large sitting room and a bathroom.

Passenger Accommodations

On the promenade deck is a social hall forward, aft being the large entrance hall leading down to the cabin deck below. On the promenade deck is also a smoking room and aft of this an attractive veranda. A dining room in the Louis Seize style has seating accommodation for 154 people, and the whole of the passenger accommodation is on a very attractive scale.

It is difficult to provide novelties in passenger liners in these days, but one or two interesting features are to be noted. Each cabin, for instance, has a special device in the roof, with the object of indicating immediately in the wheelhouse should a fire occur, and of locating it without any delay. For the holds and general protection against fire, a comprehensive Lux-Rich system is installed.

Machinery

The twin screw Sulzer machinery is designed to give a total output of 8,000 shaft horsepower at 100 revolutions per minute, with a substantial overload capacity to give higher speed in case of necessity. The two 8-cylinder engines are standard models in every respect, at any rate so far as European construction is concerned, but they are not arranged, as are many European Sulzer-engined vessels, with the controls at the level of the top of the motors. Instead, all the control levers and handles are located at the bottom, at the forward end of the engines, as is more normal with other types of Diesel machinery.

The engines have cylinders 680 millimeters bore with a piston stroke of 1,200 millimeters and the mean indicated pressure for normal output is about 95 pounds per square inch—a very moderate figure. The mechanical efficiency is in the neighborhood of 80 percent and the fuel consumption, including the power required for the scavenging blower, is slightly under 0.4 pound per brake horsepower hour.

While each engine drives two injection air compressors at the forward end, the scavenging air is obtained from the electrically operated Brown-Boveri scavenging blowers, two of which are normally in service. One of the cross heads operating the air compressors is utilized to give the drive for the 8 fuel pumps which are horizontal and located close to the control platform. Thus, the engineer has all the main operating gear close to hand, except for the valve gear, which normally does not need any attention.

2,500 Horsepower Auxiliary Plant

Although a small amount of steam is used in the galleys and for heating, electricity is general throughout. There are motors totalling about 2,500 brake horsepower and the number is probably little less than 120. The generating plant comprises four Sulzer 2-stroke, single-acting engines, each coupled to a 270-kilowatt dynamo of 220 volts, but lighting is at 110 volts so that three motor generators are installed, to reduce the pressure from 220 to 110 volts. A small semi-Diesel-engined dynamo is fitted for use in port and there is also an emergency dynamo, likewise driven by a semi-Diesel motor.

One reason why so much electric power is required is that turbo-blowers are coupled to high powered electric motors of over 250 brake horsepower. Moreover, there are a couple of electrically-driven auxiliary air compressors with motors of over 100 horsepower, while the winches and other machinery absorb a large amount of electric power, in addition to that required for various domestic services.

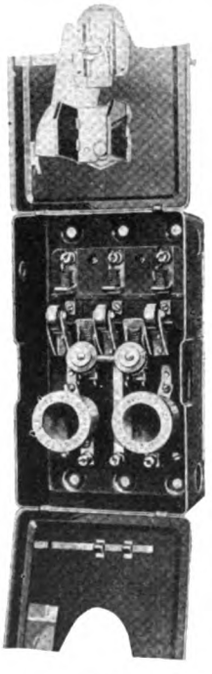
It is unnecessary to describe the auxiliary pumps in the engine room,which are on the usual scale, with the ordinary ship's pumps and the separately electrically-operated lubricating oil and cooling water pumps for the propelling engines. Mention may, however, be made of an innovation in the installation of two Stream Line renovators for the purification of the lubricating oil and having a capacity of 250 gallons of oil per hour. Moreover, a 50-ton per hour Stream Line oil separator plant for dealing with the ballast and bilge water is also utilized in this ship. A boiler of 100 pounds per square inch working pressure with a heating surface of 315 square feet is installed in a boiler compartment forward of the machinery space, and oil is carried to a large extent in double bottoms, although there are three deep tanks forward of the boiler room.

The *Santa Maria* attracted a good deal of attention in England as it is considered that she is one of those intermediate type passenger and cargo craft for which there is a big future. It is estimated that the daily fuel consumption will be in the neighborhood of 35 to 38 tons so that, with the big bunker capacity, a very large radius of action is possible without rebunkering.

It is interesting to note that the preliminary trials of the vessel, which were carried out over a measured mile course in ballast condition, were so satisfactory that the owners decided to accept the vessel on her preliminary performance and dispense with the final acceptance trials. The vessel is now in the owners' regular service between New York and the West coast of South America.

Manual Starter for Alternating Current Motors

THE Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has developed a new manual starter for alternating current motors with special features of design including an overload cut-out, cadmium plated double-break roller type contacts and a small size, safety, dust proof enclosing case.



3-pole manual motor starter

The starter is small and compact. The cover of the enclosing case is in two parts which permits opening the lower section only, for replacing fusible links in the thermal overload cut-outs. The cover can be opened only when the starter is in the off position and all current carrying parts are dead.

The roller type contacts, by breaking the arc in two places, it is claimed, give several times the life of ordinary contacts. In addition, the contact rollers turn after each operation, thus presenting a new contact surface for the next operation. The thermal overload cut-outs provide the necessary time interval to take care of starting in-rushes without shutting down the motor. It is stated that the starter is being widely used with fans, pumps, small machine tools and the like.

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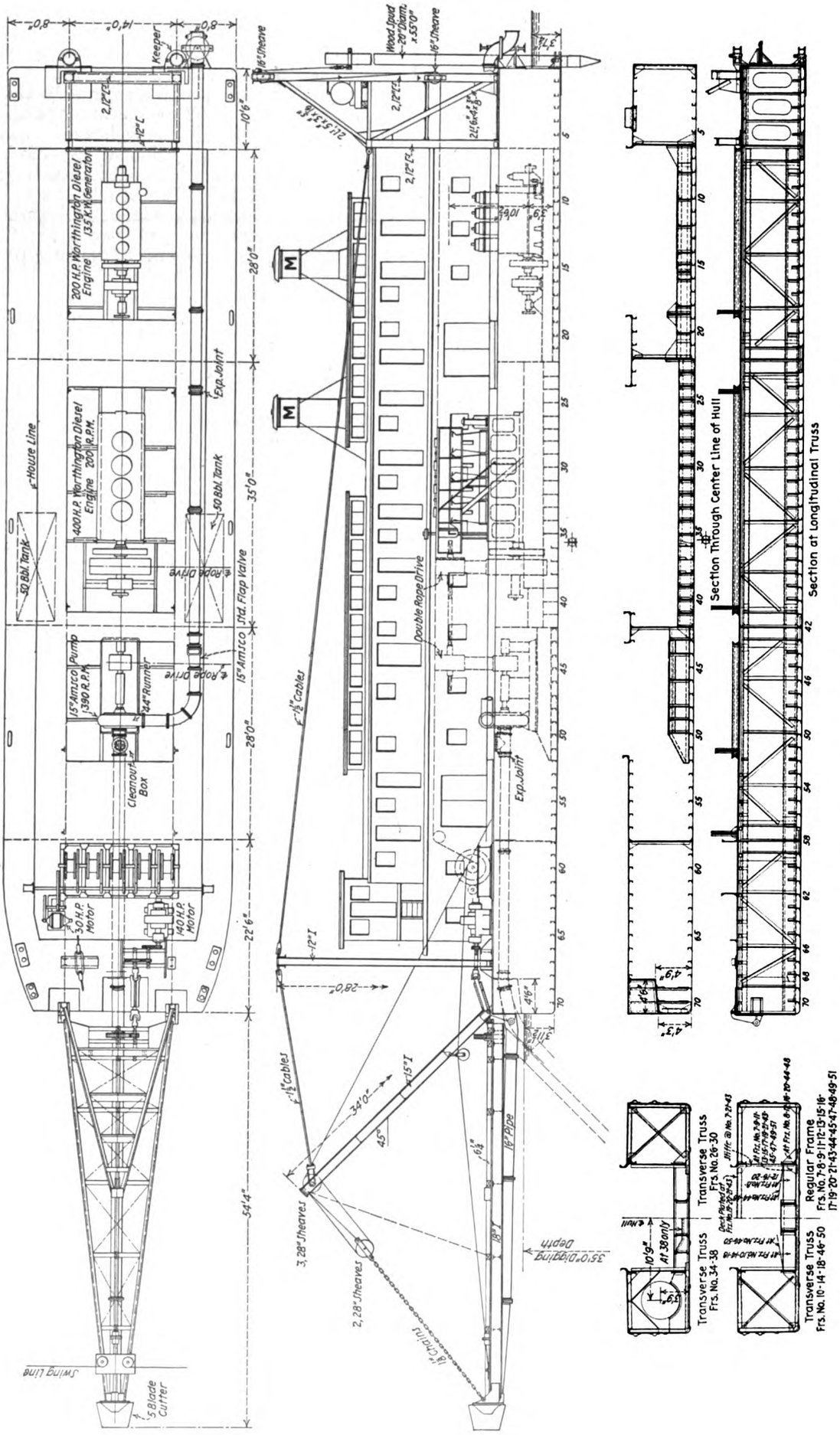

General arrangement and structural plans of 16-inch hydraulic pipe line dredge Natchez

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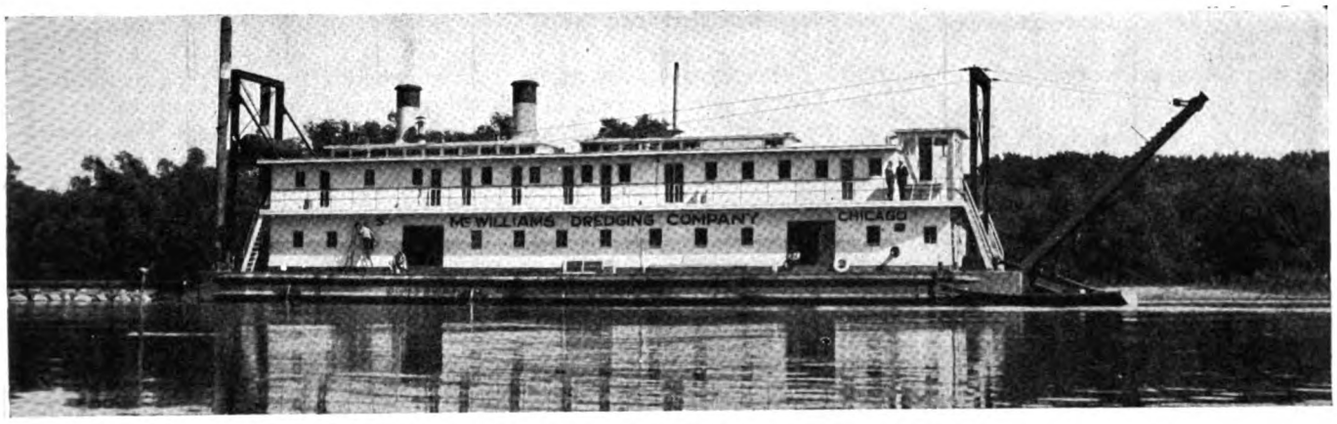


16-inch pipe line dredge Natchez

Pipe Line Dredge Natchez

16-inch pipe line dredge combines both Diesel and Diesel-electric features

By Jean M. Allen*

THE Diesel engine is today displacing steam as a prime mover in modern pipe line hydraulic dredges to, perhaps, even a greater extent than in ship propulsion. With the exception of a few straight electric dredges taking their power from shore, nearly all of the late installations of pipe line hydraulic dredges have been of the direct Diesel or Diesel-electric type. The dredge *Natchez*, recently completed and put into operation by the McWilliams Dredging Company, of Chicago, is one of the most recent. It is a modern, steel hull, 16-inch pipe line dredge combining both Diesel and Diesel-electric features. In general, it is of the conventional type, except in the manner of connecting the engine to the pump, which is done by means of a double rope drive.

Hull

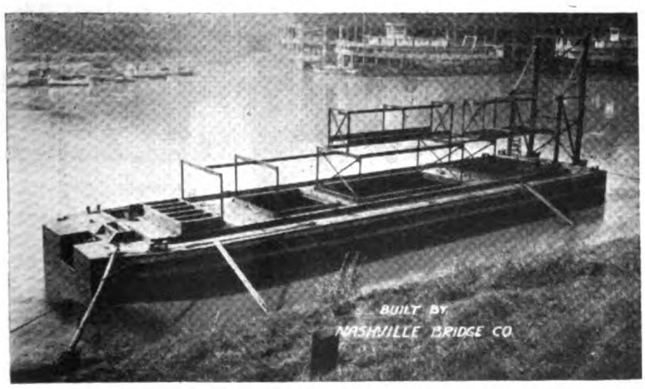
The hull, which was built by the Nashville Bridge Company, Nashville, Tenn., is of steel, 124 feet by 30 feet by 8 feet, and its working draft is 3 feet 9½ inches. No ladder well is provided, the ladder being attached directly to the bow of the hull by means of heavy cast steel trunnions. The side plating is ⅜ inch, the bottom, deck and end plating 5/16 inch, and the floors, deck beams and frames are 6-inch, 8.2-pound channels. Deep web floors are provided under the pump and engine foundations. There are 4 transverse watertight bulkheads, and 2 longitudinal trusses. The house and living quarters are of wood, accommodations for 35 men being provided.

Ladder

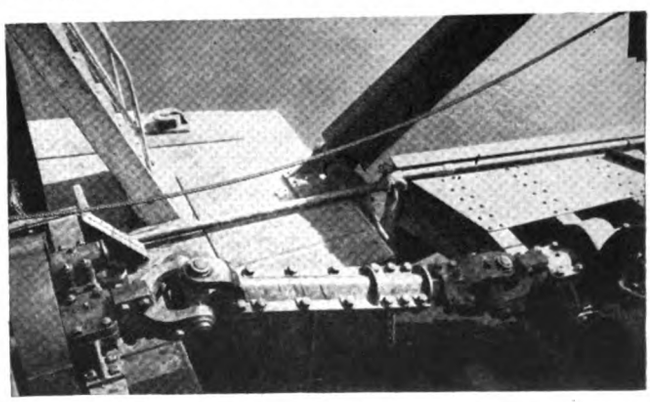
The digging ladder is of I-beam construction, 50 feet long for a digging depth of 35 feet. The cutter is of the 5-blade open type with renewable blades, and is driven by a 140 horsepower, 220 volt, direct current mill type motor, located on the deck and connected to the cutter shaft by a telescopic knuckle joint. The 5-drum hoist is of all steel construction, designed for a rope pull of 20,000 pounds at a speed of 37 feet per minute, and is equipped with outside band frictions and lowering brakes. It is driven by a 30 horsepower, 220 volt, direct current motor. The main pumping engine is a 400 horsepower, 200 revolutions per minute, Worthington vertical, four cylinder, four cycle, air injection engine, of the single acting trunk piston type. The cylinders are 17 inches in diameter by 25 inches stroke. The total weight of the engine is 140,000 pounds.

The dredging pump is a standard "Amsco" pump, of the belt driven type, built by the American Manganese Steel Company, and its normal speed is 390 revolutions per minute. The problem of connecting the engine

* Consulting engineer, Chicago, Ill.



Hull ready for installation of machinery



Cutter drive

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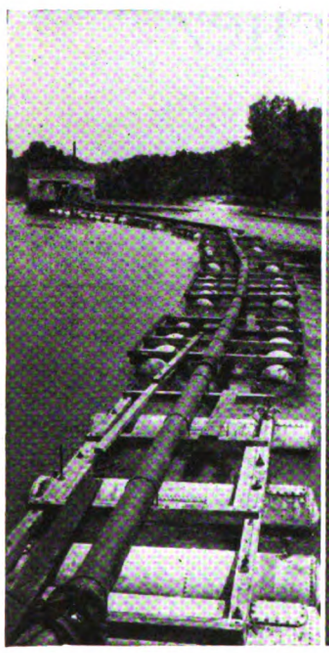
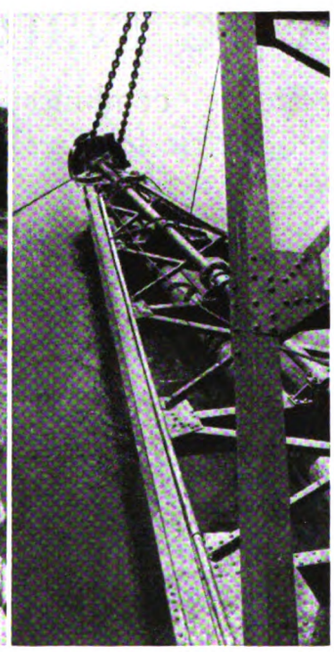
to the pump presented some difficulties. Because of the difference in speed it could not be directly connected. Speed-up gears in connection with a Diesel engine have been tried, but in addition to being very expensive they have not been entirely satisfactory. The Diesel electric type of drive is very satisfactory in service, but the first cost is high and it involves an electrical loss of from 15 to 20 percent between the engine and the pump. Single rope drive transmissions have given good service, but this arrangement requires that the pump be set to one side of the engine, and the width of the hull did not allow this. It was eventually decided to place both the pump and the engine on the center line of the hull and use a double rope drive, driving from the engine to a countershaft and back to the pump shaft. While some little difficulty was experienced due to the close quarters and short centers involved, a very compact and satisfactory arrangement was worked out by the engineers of the Dodge Manufacturing Company. Each drive consists of fourteen parts of 1¼-inch manila transmission rope arranged on the American system. It has proven very satisfactory as a drive and has the additional advantage for dredge service in that it acts as a cushion between the engine and the pump, and reduces torsional vibration in the engine.



Pontoon pipe line



Ladder

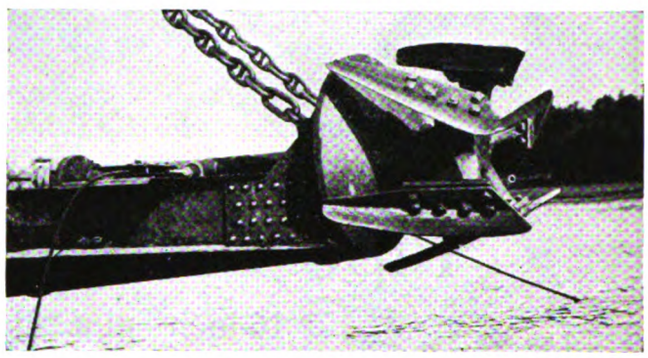
Generator

A 200 horsepower, Worthington, four cylinder, two cycle, solid injection engine drives a 135-kilowatt, 220 volt, direct current generator, which supplies power for the cutter, hoist, auxiliary pump and lights.

Twenty-inch wooden spuds, of Southern gum, work in cast steel spud guides at the stern of the dredge. These guides are fitted with swinging gates, allowing easy removal of the spuds.

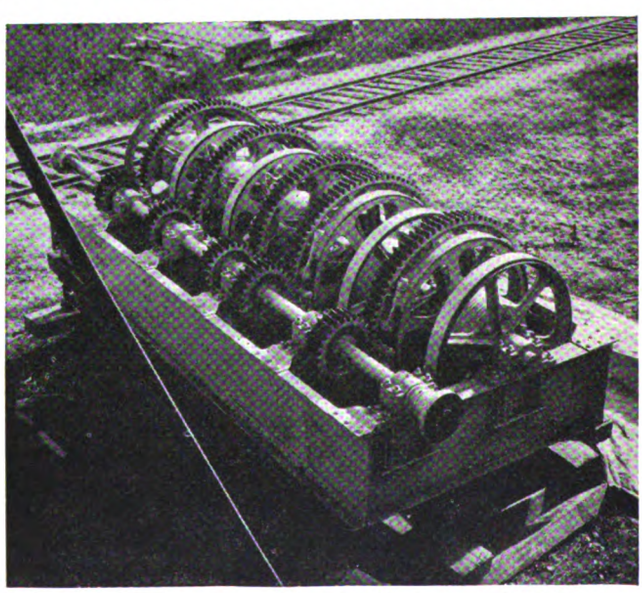
Pipe

The ladder and hull pipe is 16 inches inside diameter, ½ inch thick, hammer welded pipe, with steel flanges welded on. A rubber suction hose is provided at the bow of the boat connecting the hull pipe to the ladder pipe. The discharge pipe from the pump to the stern is laid above deck, inside the house. This location facilitates turning the pipe, which is done periodically, also replacing when worn. The stern connection to the floating pontoon line is a cast steel swivel elbow, working in conjunction with two Plummer ball joints. This has proved a very satisfactory arrangement, as the ball joints are just stiff enough to make the swivel elbow turn as the dredge swings. All of the levers from the 5-drum hoist are banked in the pilot house, together with the controls for the cutter and hoist motors. Ammeters showing the power taken by the cutter and hoist are installed in the pilot house near the gage board. These are very helpful to the levermen, as they are able at all times to tell the power being exerted by the digging mechanism.



Cutter

Two motor driven, single stage centrifugal pumps are provided for general service and fire purposes, also to provide water for ladderhead and pump bearings and engine cooling water. The cutter, hoisting machinery and spud fittings were built by the McWilliams Dredging Company in their own shops, and the assembly and erection were done by the company's own forces. The dredge, which was designed by the author, is now in operation on a contract for the United States Government, in the Mississippi River, at Clinton, Iowa.



5-drum hoist

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The Port of Portland's Diesel-electric dredge Clackamas

Diesel Drive for Hydraulic Dredges

A comparison of direct or geared Diesel engine drives with Diesel electric machinery

By J. L. Geiger*

ALTHOUGH Diesel electric drive is applicable to all types of dredges and successful installations of this machinery are numerous, it is necessary in comparing this type with the direct or the geared Diesel drive to confine the consideration to hydraulic pipe line dredges. This type of dredge is the only one on which direct connected Diesel or geared engine drive may be utilized, whereas the former type of machinery is adapted to dipper, clam shell and other dredge service.

Both types of hydraulic dredges, where the pumps are driven directly or through gearing by Diesel engines, and where Diesel engines driving generators supply current for operating motor driven equipment, have now been in operation a sufficient length of time to demonstrate the advantages and disadvantages of each.

Disadvantages of Direct Drive

The principal mechanical difficulty encountered in dredging service with direct connected or geared Diesel engines has been due to and resulting from synchronous torsional vibration. The severity of this vibration varies directly as the square of the gear ratio and explains in part the difficulties which have been experienced with geared Diesel drives. Critical speed and irregularity of torque pulsations, resulting in broken crank shafts and flaking of gears, may also be added.

The torque pulsations in a 6-cylinder, 4-cycle, single acting engine vary three times per revolution from minus 20 percent to plus 220 percent of the mean value. This negative torque means that three times per revolution the flywheel and other machinery must actually drive the engine. With a greater number of cylinders or with a 2-cycle engine, the torque variation is less, but this does not help appreciably as far as critical speeds are concerned. F. M. Lewis in a paper presented before the Society of Naval Architects and Marine Engineers, November 13, 1925, made the following statement: "It is essential that the torque at the gear faces shall not pass through zero, otherwise the pieces will separate and pound. It is doubtful whether even the best of gears will stand up long when the teeth are first separating and then knocking together several times per revolution. To meet this condition of positive torque means in effect that we must avoid all critical speeds, even many of those that in a solidly connected drive would be considered as being of very small amplitude. It means, furthermore, that we must avoid these criticals with a very wide margin."

A condition of positive torque which is essential for successful operation with geared drives is difficult to obtain and the problem is further complicated by the fact that the pump runner acts as a flywheel, producing additional driving torque on the engine during those periods when the engine torque is in the negative direction. One of the large dredging companies experienced considerable difficulty, due to gear flaking, not on the front but on the back side of the gear faces. A 6-cylinder, 4-cycle engine was installed on this dredge and the pitting occurred at three places located 120 degrees apart, corresponding to the period when the engine torque was negative and the pump runner was acting as a flywheel tending to drive the engine.

The direct driven Diesel dredge pump presents one less problem since the gears have been eliminated; however, direct drive, due to the sizes and engine speeds available at the present time, is economically applicable to only the small units. To maintain a reasonable trim of the dredge in the fore and aft direction, it is usually necessary to locate the engine slightly astern of the center of the dredge and, as the pump is usually located forward, a connecting shaft is required. This means that the system is composed of an engine crank shaft, a connecting shaft and the pump runner, which acts as a flywheel, resulting in an arrangement from which it is almost impossible to eliminate critical speeds.

There is considerable difficulty in predetermining the location of the critical speed in such a system and removing it from the operating range. This difficulty is largely due to the indeterminate nature of the pump runner. Runners are also changed frequently due to chang-

* Sales engineer, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

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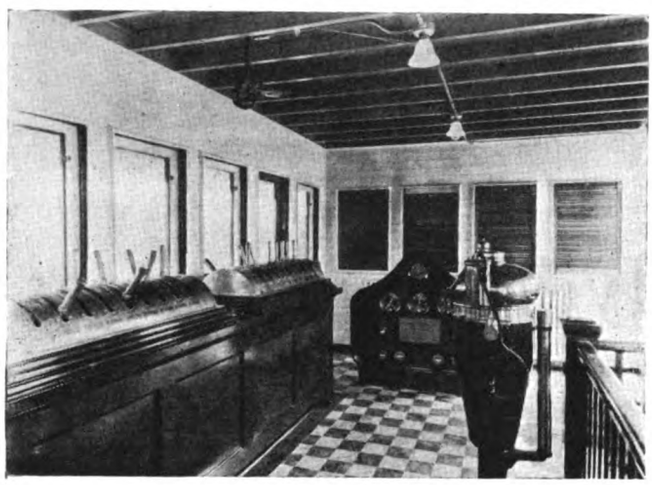
ing pumping conditions and it is seldom that any two runners have the same mass and moment of inertia. There is also the possibility of material getting stuck in the runner or of one of the vanes getting clogged, temporarily at least changing the mass and inertia of the runner. Dredge pump engines are frequently operated over a considerable speed range, which increases the difficulty of eliminating critical speeds from the operating range. The probability of a critical speed existing in any installation is proportional to the range of speed over which the engine is to operate.



Pilot house controls of the dredge Clackamas

Application of Diesel Electric Drive

Diesel electric drive should eliminate all difficulty from torsional vibration and critical speeds provided the proper investigation and calculations are made before engine flywheels and other parts are designed. With this system of operation, the Diesel engine drives a direct current generator, the armature of which is pressed on the engine extension shaft. There are no indeterminate masses, for the weight and inertia are constant and easily determined. There is also no speed range over which a critical speed must be avoided for the engine operates at a constant speed. Breakage of crank shafts on electric drives due to critical speeds can be definitely prevented by proper precautions in the original design.

A large Diesel electric dredge should be provided with several engines, probably four engines being the preferable arrangement, direct connected to direct current generators. These engines will consequently operate at a higher speed, resulting in a much smaller weight and cost per horsepower. The total weight of the engines for a Diesel electric dredge will not exceed 75 percent of the weight of the direct connected Diesel engine. The cost of the engines will be considerably less, as engines for electric drive will cost from $50 to $60 per horsepower, while those for direct drive will cost from $75 to $80 per horsepower.

Relative Installation Costs

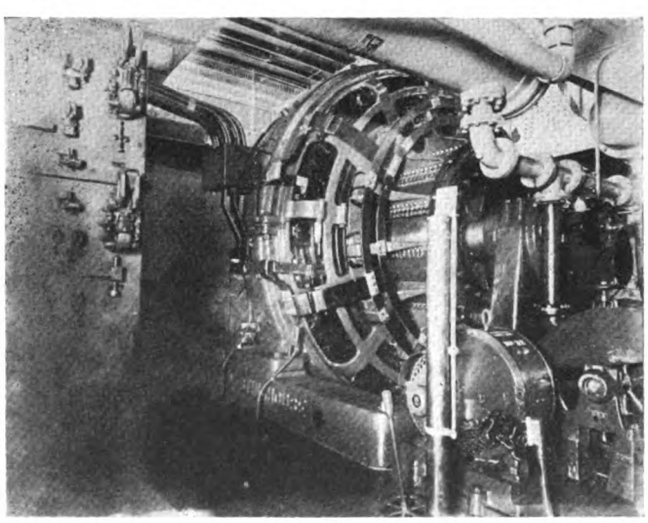
Diesel electric drive using several smaller, lighter weight units requires a far less expensive foundation. Recently a designer for one of the large dredging companies, in obtaining estimates on the hull for a 26-inch dredge, found that the hull and foundations for a Diesel geared dredge would cost $18,000 more than for a Diesel electric dredge of the same size. The electric drive units may be located in the hull to better advantage, as there is no fixed relation between the engines and the pump, as is the case with the direct drive. With electric drive the engines can be located where most convenient and where they will give the dredge the best trim. The single large engine required for Diesel drive will be approximately 50 percent greater in height than the engines for Diesel electric drive, resulting in increased cost of the superstructure as well as hull.

A Diesel engine is inherently maximum rated and is not capable of carrying sustained overload without increasing the repair bills and decreasing the life of the engine. Combustion at overloads is also poorer and the engines frequently smoke, indicating that fuel is being wasted. It is rather difficult to tell when a direct connected engine is overloaded, the only indication being a cloudy exhaust, which may also be due to other causes. Reduction in the life of the engines due to the continuous operation at an overload can be prevented with electric drive by the use of electrical protective devices and a graphic record of the load can be obtained at all times and preserved for record purposes if desired. The engines can also be maintained at higher efficiency and kept in condition to carry their full rated load at all times, as the electrical instruments on the switchboard show instantly when an engine is producing less than normal power.

Electric drive considerably reduces the possibilities of damage to the pump through jamming due to foreign materials such as logs and stumps lodging in it. The inertia of the rotating masses connected to the pump with electric drive are smaller than with Diesel drive. Jamming of the pump runner with direct or geared drive due to the inertia of the rotating parts would in all probability injure either the gear or the engine and possibly both.

Flexibility of Electric Drive

The flexibility of electric drive can be approached with no other type of drive. The preferable arrangement for electric drive is to have all the generators operate in parallel feeding to a common bus. The power for driving the pump and all auxiliaries is taken from this bus. If the auxiliary load is light the additional power may be applied to the pump and increased yardage moved. If the dredge is in hard digging with a short pipe line, the power not required by the pump can be applied to the cutter, increasing its digging ca-



2,700 horsepower main pump motor of the dredge Clackamas

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pacity. If the digging is easy, one engine can be shut down entirely. This will enable the dredge to operate with one engine undergoing repairs, which means that shut-downs of the dredge due to inspection and repairs will practically be eliminated as one engine can be shut down and the dredge maintained in service. A Diesel engine also operates with its lowest fuel consumption when operating at or nearly full load, so that from the standpoint of efficient operation it is better to operate some of the units fully loaded than all engines partially loaded.

When the dredge pump is geared or directly connected to the engine, there is no possibility of interchange of power between the main and auxiliary engines. The main pumping engine may be badly overloaded while the auxiliary engine is slightly loaded. Diesel electric drive permits of an efficient distribution of the load, resulting in increased output with the same or less power. The ease with which power can be interchanged between the main and auxiliary units has recently resulted in the decision of one of the large dredging companies to completely electrify its direct Diesel driven dredge. When this dredge is electrified it will be the largest Diesel electric dredge on the Atlantic coast.

Best Type of Motor Drive

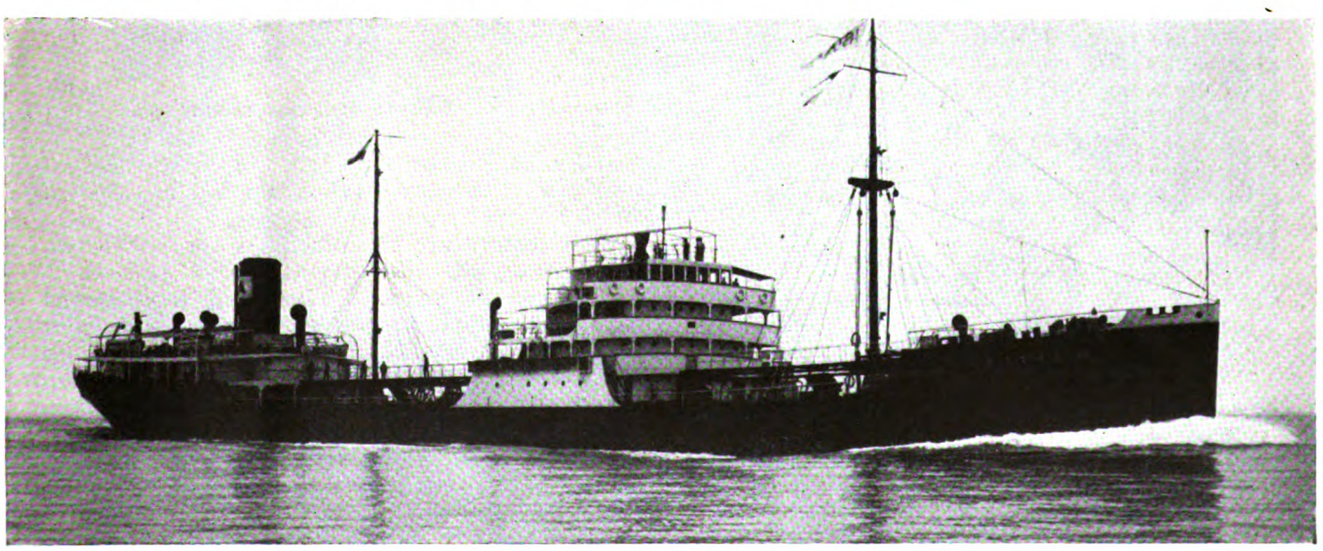
A compound wound direct current motor provides an ideal drive for a dredge pump. When the pipe line begins to clog, the load being decreased, the speed of the motor automatically increases, increasing the hydrostatic head in the pipe line which assists in forcing the plug out of the line. A motor will also deliver full power over a considerable speed range, allowing the motor speed to be adjusted to produce the most efficient pipe line velocity with variation in lengths of pipe line and materials handled without changing the pump runner. The motor of the Diesel electric dredge *Clackamas* will deliver full power over a speed range from 250 to 350 revolutions per minute. Wide speed variation on the pump is a necessity for the dredges owned by the commercial dredging companies, if they are to operate efficiently and economically on the varying lengths of pipe line and with varying materials to be moved. Unfortunately the Diesel engine is not capable of operating over a very wide speed range and the power output also varies directly with the speed. With changing dredging conditions, it is therefore necessary to change pump runners, resulting in delays and loss of output. The Diesel engine, driving directly, cannot speed up sufficiently in case of an impending plug in the line to be of much assistance in effecting its ready removal.

The economies effected through the flexibility, the ability to interchange power between the pump and auxiliary units and the ability of the motor to deliver full power over a wide speed range, more than counterbalance the electrical losses. This fact was conclusively demonstrated by operating data recently published by the Port of Portland, Oregon. The Diesel electric dredge, with the same length of pipe line and the same material, pumped 50 percent more materials per engine horsepower than any of the other dredges. Engine horsepower in the case of the Diesel electric dredge refers to the engines driving the generators and not to the motor driving the pump.

Operating results indicate that in the present state of development of the Diesel engine there are two possible fields for the direct connected or geared Diesel drive for dredge pumps. The first is for small dredges, 10 or 12 inches or less, and the second, those jobs where the dredge can be operated with a practically constant length of pipe line and pumping head. The Diesel electric drive is applicable to the large dredges, particularly for the use of dredging contractors, who must operate efficiently and economically with widely varying lengths of pipe line, materials and various dredging conditions.

Tanker Completed in Italy in Ten Months

THE steam tanker *Astra III*, which required only 10 months for construction, was recently delivered to her owners, The Astra Compania Argentina de Petroleo of Buenos Ayres. This tanker, which is of 7,500 tons capacity, was built at the Cantiere Navale Triestino at Monfalcone, Italy, for the Astra company. The vessel was launched on April 14 and the installation of machinery completed in less than a month after that date.



Tank steamer Astra III

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The main particulars of the *Astra III* are as follows:

Length between perpendiculars	295 feet
Breadth, maximum	55 feet
Depth, molded	23 feet

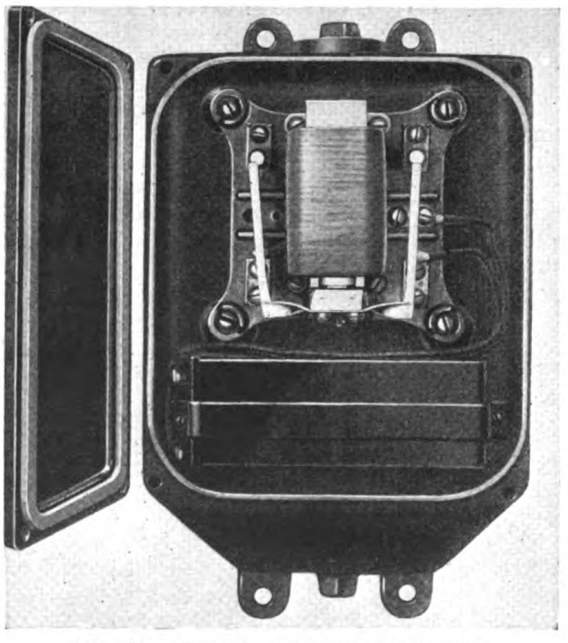
The propelling machinery consists of a triple expansion engine developing 3,300 shaft horsepower which is located aft.

The vessel is fitted with ten tanks for carrying a cargo of fuel oil and with one general cargo hold. As will be seen from the illustration, the *Astra III* follows accepted tanker design with a forecastle in which storage space is provided, a central superstructure housing the deck officers and the navigating bridge. Accommodations are also provided here for 8 passengers. The engineer officers and the crew quarters are located aft in the poop.

On her trial run over a measured mile course the *Astra III* developed an average speed of 12.846 miles per hour as against the contract speed of 12.5 miles per hour. On the trial run the boiler pressure developed was 200 pounds per square inch, while the pressure in the high pressure cylinder was 200 pounds per square inch, in the intermediate cylinder 63 pounds per square inch and in the low pressure cylinder 12 pounds per square inch. The average power developed was 3,480 indicated horsepower at a speed of 77.89 revolutions per minute. The fuel oil consumption was 1.08 pounds per indicated horsepower.

Relays for Marine Use

THE Signal Engineering & Manufacturing Company of New York has developed a telephone extension relay that is suitable for marine use. This type of telephone relay is used for operating horn signals, howlers, or large vibrating bells at telephone



The Signal Engineering extension relay

stations in noisy locations in order to call men on watch to the telephone.

The operation of the relay is entirely automatic. Upon application of the telephone ringing current which is usually of a frequency of 16 2/3 cycles, the relay contacts close, thereby operating a loud signal device. The relay contacts open and stop the horn or howler when the telephone ringing current is cut off. The relay coil consumes approximately 1 watt and operates on as low as 50 volts, the rating being 90 volts, and 16 2/3 or 20 cycles.

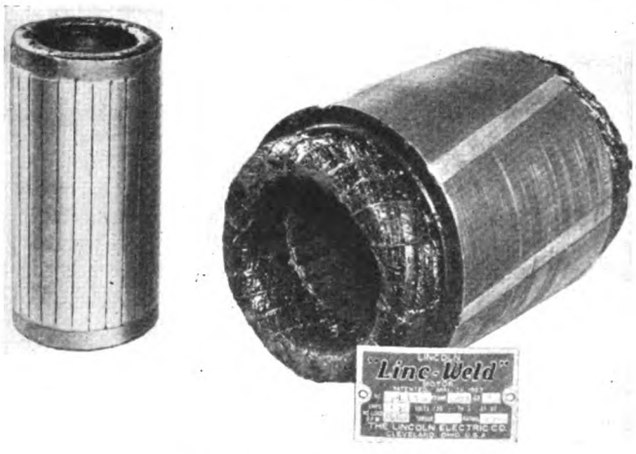
The cores of the relay are laminated and cadmium plated which gives permanent protection against the corrosion caused by salt water or acid fumes. All copper and brass parts of the relay are nickel plated. The contacts are silver to silver. The relay coil is form wound and triple impregnated with perfect moisture proofing. All circuit carrying parts of the relay are capable of withstanding a breakdown test of 2,500 volts.

These relays conform to the United States Navy specifications which require tests for operation or fall out under heavy gun fire and roll of the ship up to 45 degrees. Signal engineering relays are designed for operation on the gravity principle and are not spring loaded. Each relay is enclosed in a splash proof cast aluminum housing for extreme marine weather conditions.

Relays of this type have been installed on the aeroplane carriers *Lexington* and *Saratoga*.

New Shell Type Motor

THE Lincoln Electric Company, Cleveland, O., manufacturers of "Stable-Arc" welders and "Linc-Weld" motors, have just perfected a squirrel cage motor for use in various kinds of wood working machinery and all other machinery requiring high speed motors. This motor is of the so-called shell type,



Lincoln shell type motor

an all-welded design, and is made to the standard dimensions of the trade. It is supplied in two sizes, 3 and 5 horsepower.

Both motors are manufactured for either two or three phase, 60 cycle current and a speed of 3,600 revolutions per minute. The stator is composed of laminated sections arc-welded together. The welding is done while the shell is under pressure and is placed in six transverse slots. The rotor is also entirely arc-welded and provided with either a straight or tapered bore. The welding does away with the necessity of a solid shell about the laminations and also replaces the conventional rivets, thus the amount of active field is kept at a maximum. The effect of this is to increase the magnetic flux and allow more copper to be used in the slot. Greater magnetic flux means better operating

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characteristics. This increase of copper makes for a cooler running motor and permits greater overload.

As normally used the stator is secured in the frame of the machine and the rotor is mounted on the tool shaft. If desired the stator will be supplied with six-foot leads.

Boring and Turning Mill

FIGS. 1 and 2 show a 20-foot boring and turning mill of new design, recently built by the Niles Tool Works Company, Division of Niles-Bement-Pond Company. The right hand housing has been built of considerably heavier proportions than the left hand housing and the housing face widened and provided with a three-track bearing to receive a side head.

Both saddle and bar feed for either head may be engaged simultaneously for the purpose of cutting tapers and, in conjunction with the swiveling of the saddles, tapers may be cut which are not obtainable by the sole use of the down feed combined with the swiveling of the saddles. The engagement of the combined feeds is secured through positive clutches housed in gear cases at each end of the rail. The regular feeding and rapid traverse movements of the saddles and bars, however, are operative by means of large friction clutches. A single lever with inter-lock between positive and friction clutches is the medium for changing over from positive to friction feeds and vice versa.. The motors for the rapid traverse of bars and saddles are located at each end of the rail as shown in Fig. 2. These motors are inactive except when rapid traverse is in operation the movement of the rapid traverse levers depressing push buttons which govern the rotation of the armatures.

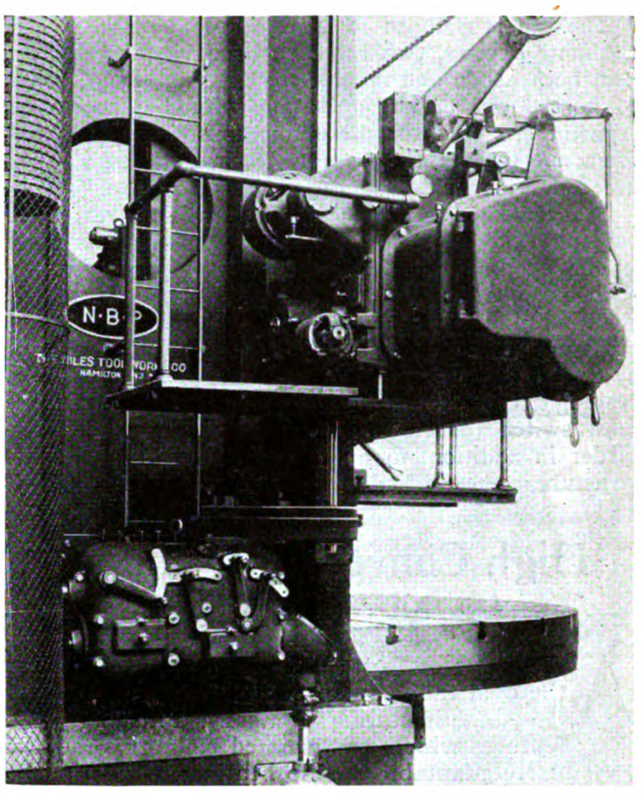

Fig. 2.—Close-up view showing motors at end of rail for rapid traverse of bars and saddles

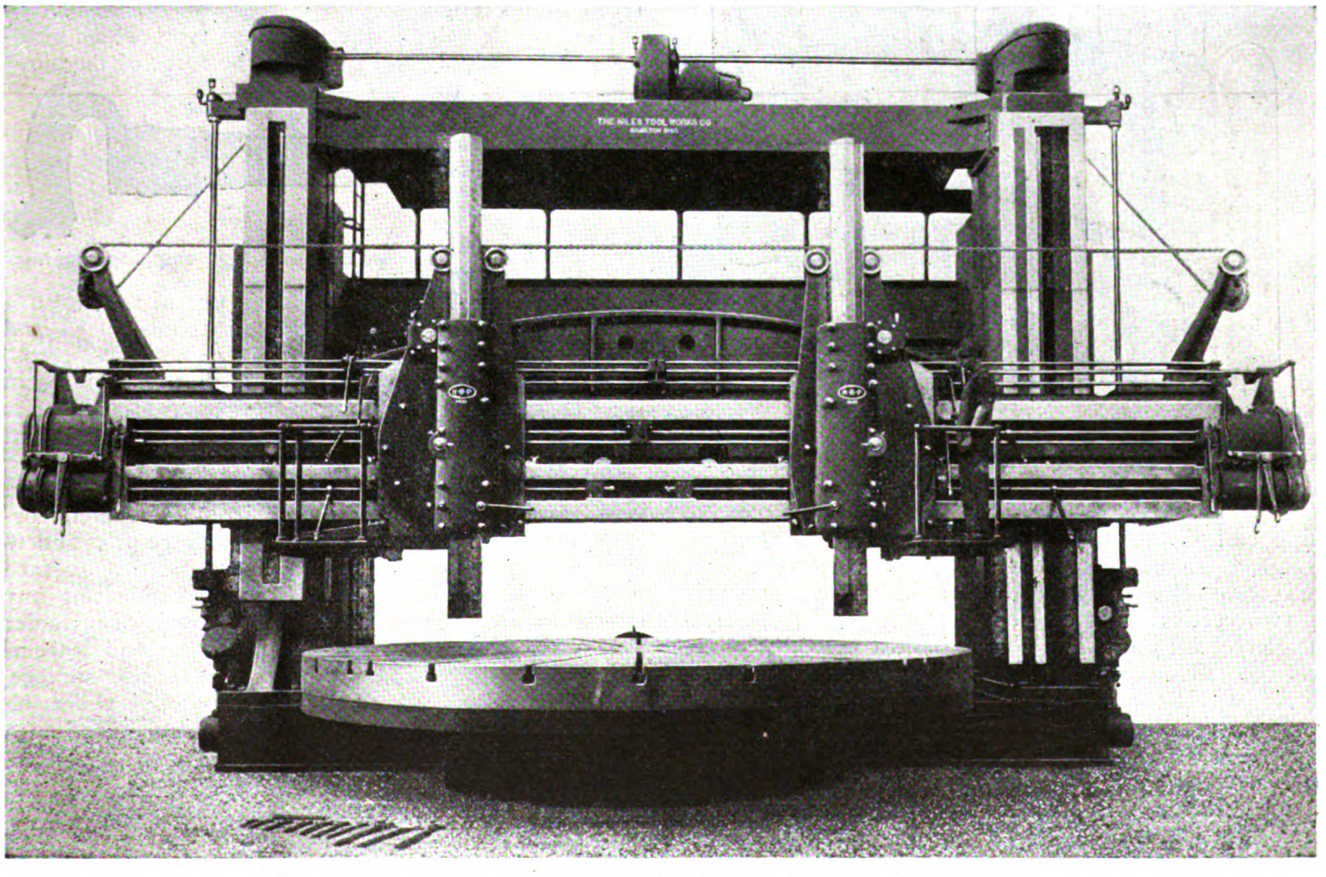

Fig. 1.—Front view of new Niles 20-foot heavy boring and turning mill

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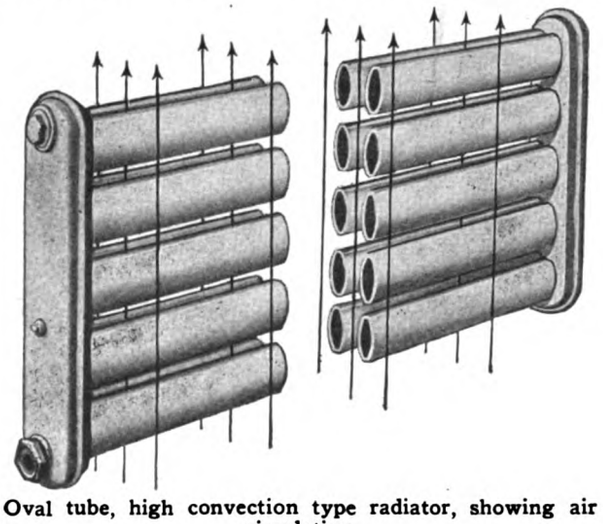
The rail is clamped to the housings by four electric clamping devices, two for each housing, the rail being held both inside and outside the housing. High torque ½ horsepower motors operating through a worm and segment are used for these functions. Clamping nuts are connected to these parts by cranks and levers. There are four clamping volts for each housing.

The machine is driven by a 50 horsepower, direct current variable speed motor and a 20 horsepower motor is employed to elevate the crossrail. Other features, such as double table tracks with pressure lubrication, steel bars, sliding gear feed boxes, square box section crossrail with stiffening beam, elimination of top works by the use of separate motors for rapid traverse, direct reading micrometer dials for saddle and bar movements, limit switch for elevation of crossrail, and built-up girder in addition to top brace to strengthen upper structure, are embodied in this mill.

High Convection Radiators for Marine Service

A NEW model high convection heating radiator of the oval tube type produced by the Shaw-Perkins Manufacturing Company, Pittsburgh, Pa., offers features which it is claimed make this radiator particularly adaptable to ship heating installations.

Shaw-Perkins standard oval tube radiation equipment has been developed over a period of years for heat exchanging purposes in many diversified fields. The new model radiator is made throughout of Armco ingot iron and utilizes the proven principles of

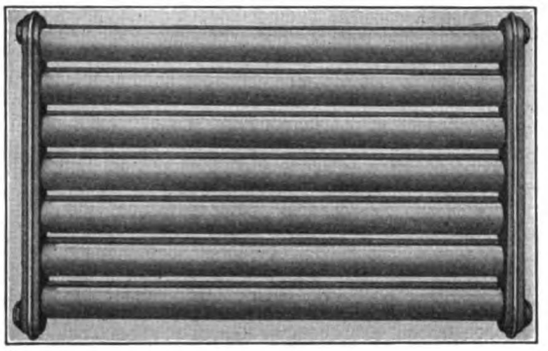


Oval tube, high convection type radiator, showing air circulation

pipe coil design. The radiator is light in weight, compact, sanitary and heats or cools rapidly. The oval tubes incorporated in the design are arranged in two vertical rows connected at each end to vertical headers. All joints and connections are welded, making the radiator a jointless, one-piece unit.

As will be noted in the radiation diagram, the radiator is all prime heating surface, the arrangement of the oval tubes allowing air to pass freely, being unimpeded by fins, plates, top or bottom hub connections. This feature results in a high heat emission by means of convection.

These radiators are made in low, narrow, one-piece units up to 14 feet in length which, combined with the convection feature, insures a uniform and rapid temperature distribution throughout the space to be heated. The radiators are finished in dull gray



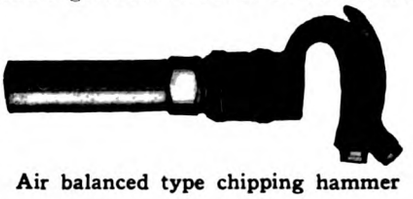
Shaw-Perkins radiator for wall suspension

lacquer and legs or brackets may be fitted for floor installation or wall suspension. Other designs with different tube and header arrangements than the one shown may be obtained for horizontal installations, which is sometimes desirable.

The Cleco Chipping Hammer

THE Cleveland Pneumatic Tool Company, Cleveland, Ohio, has recently brought out a new chipping hammer. This tool embodies a new method of air circulation and control which permits of exceedingly high speed without short stroking or sacrificing power or easy holding qualities of the hammer. This Cleco hammer is air balanced and each of its moving parts is synchronized to eliminate vibration and recoil in operation.

The throttle valve is the two stage type, which graduates the air supply and regulates the force of the blow. The valve is the ball type and has a graduating apron at the front so tapered as to allow the air to pass into the hammer gradually and as the thumb latch is further depressed the movement of the piston is gradually accelerated until the maximum speed and power of the blow is reached, thus eliminating all recoil, or vibration in action. No air vent port is required in the Cleco throttle valve and therefore no loss of air is experienced at this point which would be wasteful and annoying to the operator.



Air balanced type chipping hammer

The cylinder at its forward end is reinforced by a tapered retaining wall and the piston is tapered correspondingly which eliminates any breakage of cylinders at this point. The piston has liberal bearing surface which makes for steadiness in action eliminating any lateral motion which causes undue wear of cylinder bore. The main valve is the spool type and is reinforced at the lower end and has liberal bearing surface. The valve, valve block and cylinder have liberal bearing surfaces which are hardened, ground and honed to a glass-like finish.

The handle is drop forged, of alloy steel, of proven quality for pneumatic service and is made in two types with clamp bolt lock or ratchet lock, as preferred. Two styles of handles are furnished—open or enclosed with outside latch.

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A Reverse Launching

An unusual method of hauling out a submarine from the water

By Lieut. Carleton Shugg, U. S. N.

A UNIQUE method of removing a vessel from the water is shown in the case of the U. S. submarine *S-48* which was repaired at the Navy Yard, Portsmouth, N. H., during the past year. Repairs and alterations to the submarine required it to be out of water for about a year and inasmuch as the yard had but one graving dock and no marine railway, it was necessary to devise a method of handling the ship which would not tie up the use of the one dry dock available to other vessels. The means employed and executed on February 3, 1927, were of a temporary nature and might be compared to a reversal of the usual launching arrangements. Whereas it is seldom that the lack of docking facilities makes such a procedure necessary, the operations presented several unique features which might be used in part.

In its decommissioned status the *S-48* had a draft forward of 11 feet 10½ inches, aft 13 feet 5 inches, and a corresponding displacement of 908 tons. The depth of water over the end of the ground ways in the available building slip was only 10.6 feet at mean high water. A strong cross current prevails off the way end at all times except during slack water, which occurs two hours after high water. Any centering of a ship over these ways would normally be undertaken only during slack water, at which time the drop of the tide is such as to reduce the water over the way end to 9.1 feet. Any form of cradle entailed a still further loss in effective draft available at the way end.

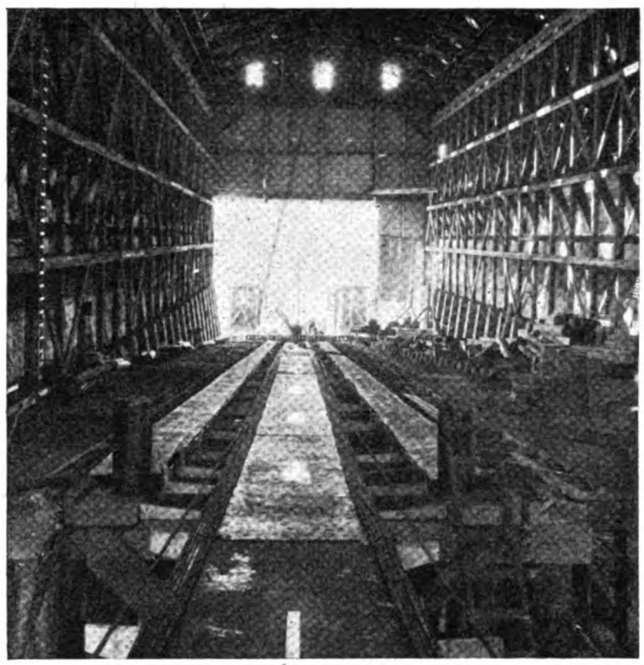
The submarine was lightened and trimmed aft as much as practicable, placed in dry dock where a cradle, similar to the sliding ways and packing used in an ordinary launching, was fixed to the hull, and then ship and cradle, as a unit, were floated over the ground ways of the building slip to a point where hauling could be commenced. Although the use of the marine railway type of free roller would entail less friction, it was discarded in favor of grease, due to the accurate centering of ship and cradle over the ways which would be necessary with flanged rollers.

The use of grease required reducing to a minimum the amount of pivoting which would occur as the vessel became entirely wayborne. The high unit pressures on the grease which are obtained in an ordinary launching as the ship pivots are not as serious in launching as in hauling up. In the former instance the vessel has considerable speed and momentum at pivoting and in most cases would probably complete its run even if wood to wood contact occurred during pivoting. In the case of hauling up, the entire length of the cradle must pass over, at a very slow speed, that area of ground ways which has had its lubrication perhaps seriously disturbed by pivoting pressures.

It was therefore decided to trim the ship, and also the sliding ways in relation to the ship, so that while afloat the sliding ways would be nearly parallel to the ground ways. This also resulted in considerably less draft forward and allowed the ship to come in further over the ways before hauling became necessary. It was, of course, necessary at the completion of any pivoting action that the center of gravity of the ship should be inboard of the way end. It also seemed more economical to gain the added depth of water afforded by operating during high water even though the somewhat extensive centering arrangements described later would then be necessary to offset the cross currents.

Landing Vessel on Ways

The first step in obtaining the desired draft and trim of the ship was the patching and unwatering of fourteen of the ship's tanks which had been bilged by grounding off Portsmouth Harbor entrance during a blizzard. The resulting decrease in displacement was 182 tons. The displacement was further reduced by removing all weights whose removal would subsequently be necessary anyway incident to authorized repairs and alterations. These items included main engines, auxiliaries and main motor armatures and fields, and totalled 134 tons. The resulting dead light displacement was 592 tons but the vessel had little trim. Trimming by the addition of ballast aft, if carried to an excess, would offset its advantages by the resulting increase in mean draft. Also, any ordinary fixed ballast would add to the deadweight to be hauled up. Ten tons of fixed ballast in the form of pig lead in the bilges, was added to offset list and assist stability. Twenty-seven tons of portable water ballast was obtained by filling the aftermost tanks and steering gear compartment. This water ballast could be blown overboard through the regular sea connections as soon as it had served its purpose in trim-



View in Franklin ship house, showing the covered greased ways, guide dolphins and hauling block rigged for hauling out the submarine

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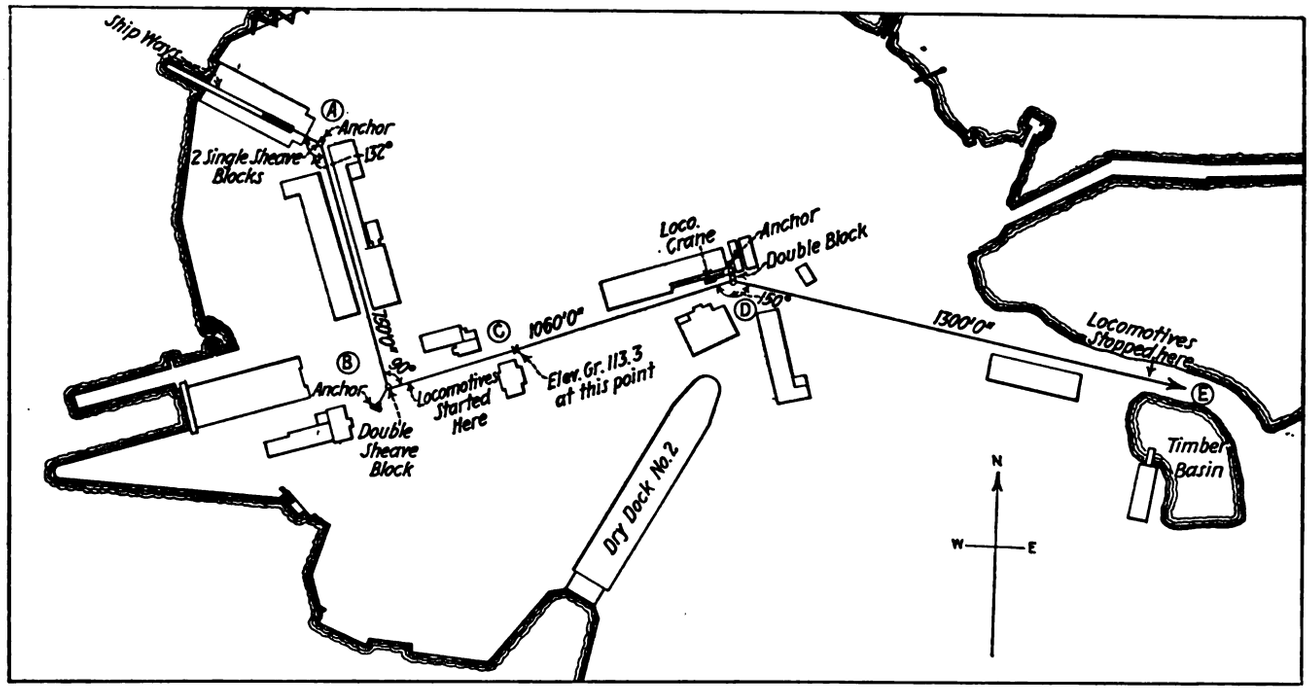
ming the ship to the ways. Additional portable ballast was obtained by hanging twenty-eight tons of lead over the stern with manila straps in such a manner that, having served in obtaining initial trim, it could be quickly dropped by cutting the manila straps. The lower vertical rudder gudgeon was utilized as an eye and the manila hanging straps passed through it before attaching to the lead, so that although the lead could be released by cutting the straps on top of the hull, its weight acted as if suspended from the rudder gudgeon. The total ballast weight of 65 tons raised the displacement to 657 tons.

The estimated weight and buoyancy of the cradle and fenders were then applied and the resulting calculated drafts of the ship in hauling up gave a trim by the stern of 65 inches. The inclination of the ground ways (13/16 inch per foot) over the same length was 169 inches. The sliding ways of the cradle were therefore given 82½ inches more trim than the keel of the ship. When afloat, the sliding ways then had 22 inches less trim than the ground ways. This figure determined the amount of pivoting. The pivoting pressures were calculated and also the travel of the ship from that point where the bow first touched the ways to that point where pivoting ceased. While maintaining this relative trim between ship and sliding ways, it was desirable to place the latter as close to the hull as possible in order to reduce the draft forward. The resulting minimum distance between the hull and the underside of the sliding ways was 9 inches. As the top surface of the ground ways was only a few inches above the floor of the building ways, this would ordinarily have necessitated jacking up the ship after hauling out in order to secure working room beneath the keel. However, the forward end of the ground ways was carried above the ground level on wooden bents. The *S-48* was therefore hauled ahead far enough so that the close portion of the cradle would land in way of this raised section of ground ways and no jacking up was necessary.

Due to the above measures it was necessary to extend the underwater length of the ground ways only 12 feet, in order to provide a margin against an unexpectedly low high water from adverse winds. The underwater ground ways were so made up that the upper 3 inches were in the form of a detachable shoe which could be brought above water, dried, thoroughly coated with stearine and grease, and again lowered just prior to hauling up.

The calculated total pivoting pressure corresponding to a 22-inch difference of trim was 32 tons. To provide for this pivoting, a slipper 6 feet long was fitted at the forward end of each sliding way. The reaction of the slipper was transmitted to the packing above it through a 6-inch roller placed transversely between the mid-length of the slipper and the packing above.



Plan of hauling up operations

The ship and attached cradle were guided onto the ground ways by three means, acting in succession. Two pairs of guide dolphins, straddling the ground ways, were erected, the distance along the ways between the two pairs being one-third the length of the ship. The outboard pair consisted of piling, the inboard pair of rock ballasted cribs. They were designed to engage parallel fenders built on the ship. The dolphins were topped with working platforms and a cleat for handling breast lines to the ship. The ship fenders were built parallel to the centerline of the ship and were beveled inboard at their forward ends for easy entering into a pair of dolphins. The spread to the outside of the fenders was two inches less than the clearance between the guide struts on the dolphins. As the dolphins were capable of springing or giving several inches, it was desired to provide further guidance of the sliding ways on to the ground ways.

This might be obtained by allowing more spread and height to the ground ways ribbands over that length which first received the sliding ways. Several pairs of ribband brackets or "horns" were therefore fitted, the sloping inboard faces of which would guide the lower outboard edge of the sliding way down inside the ribbands proper. The upper corner of these brackets was 11 inches above the surface of the ground way and 5

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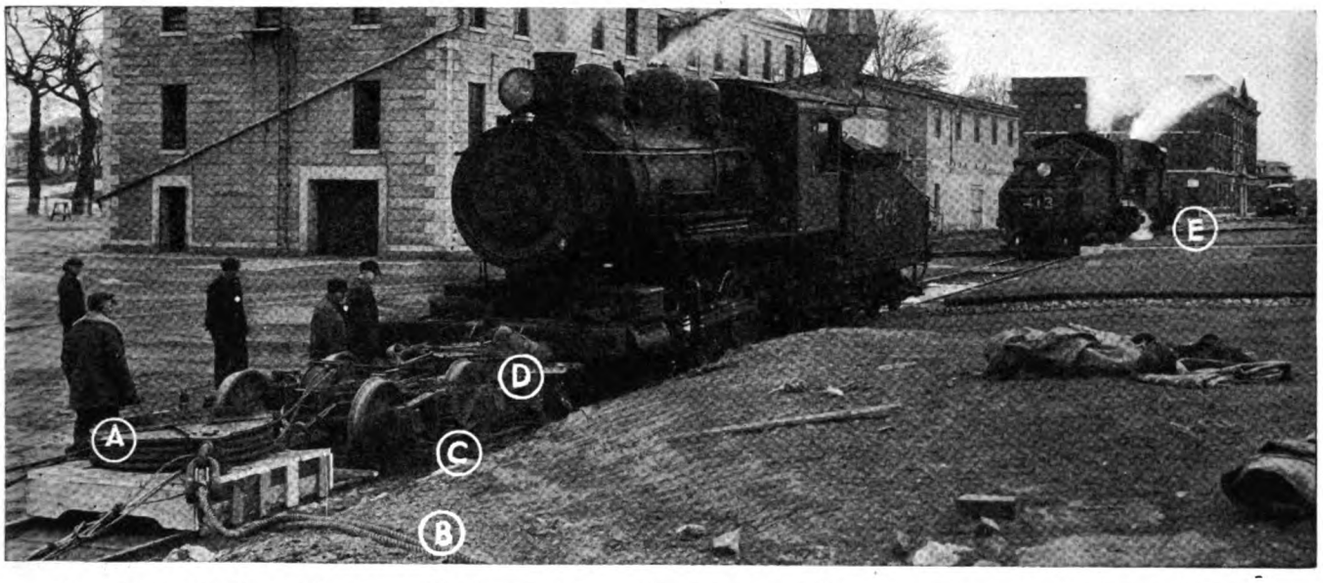
inches outboard of the inboard face of the ribband. The fore and aft extent of the parallel fenders on the ship and the position of the dolphins were so related that the ship was engaged by both pairs of dolphins, and centered within their accuracy, before the sliding ways had come down to the height of the ribband brackets. There was thus no chance of the sliding ways landing on top of the ribband brackets. Finally, the ribbands on the ground ways were outside, and the spread between their inboard faces was 4 inches greater than the spread to the outside of the sliding ways. More clearance between sliding ways and ground ways ribbands was desired for ease in centering and to allow for misalinement and swelling or spread of the cradle, for the engines would be 15 x 325, or 4,875 feet. It was, therefore, decided to double the number of engines and haul on both ends of the tackle at once, instead of having one end fixed. This resulted in a 14-part tackle which was the equivalent of two 7-part tackles operated simultaneously. Both ends of the wire were led to the closest locomotive and hauled together. This required a net run of 7 x 325, or 2,275 feet. The 75 feet remaining available was not enough to allow for the length of the engines themselves and the expected amount of slack and stretch. The ship was, therefore, hauled ahead an initial distance of 15 feet by means of the hoisting drums on two yard locomotive cranes secured on a spur track at the head of the ways. The main



View down McDonough avenue, showing straight engine pull to the railroad curve in front of building No. 25

A—90-degree lead block. B—To buried anchor. C—Roller truck. D—30-degree lead block to be secured to anchor at building No. 25 as engine rounds curve. E—Roller truck stops here at top of grade.

but it was believed that too much clearance would allow the ship to skew excessively as it came up the ways. The above centering arrangements gave no trouble whatsoever, despite the strong cross rip.

Hauling and Holding

The use of railroad locomotives, hauling through the two seven-sheave block tackle, was adopted to haul out the vessel because of the low cost and flexibility of power afforded. The pull could be increased to the limit of strength of the wire rope by the employment of additional engines and the long lead of wire gave elasticity to the rig and reduced the effect of sudden loads. The layout of existing yard trackage adjacent to the building slip, however, did not afford a long straight run for the locomotives. The best track available involved starting the engines at a point 750 feet from the ways and at an angle with them, and then afforded a run of 2,350 feet with a 30-degree curve at about mid-length. The total movement required of the ship, from that point where its bow first became way borne, was 325 feet. It was desired to complete the entire operation on one haul, without fleeting back, so as to avoid the greater pull necessary to overcome starting friction if the ship were allowed to come to rest on the grease after once ceasing to be water borne.

If the blocks were so rigged as to give a 15-part tackle with only one hauling end, the net run necessary hauling block was then connected to the ship and the remainder of the haul made by the railroad engines plus the crane hoisting drums.

The estimated total weight of ship, cradle, hauling block, and falls was 720 tons. The slope of the ground ways being 13/16 inch per foot, the component of gravity to be overcome was 48.7 tons. It was determined by experiment that the frictional coefficient of the grease might run as high as 10 percent. Although this figure is far in excess of any encountered in launching, it is to be remembered that the comparatively slow rate of travel in hauling out is such that any heat generated between the large areas in sliding contact is dissipated without softening the grease. The total pull to be provided was, therefore, 48.7 plus 72, or 121 tons. The mechanical advantage of the main tackle, its frictional losses, and the frictional losses of the various lead blocks and the dragging of the wire rope along the ground resulted in a calculated pull necessary at the end of one part, at the finish of the run, of 12.2 tons. The total pull required of the engines was 24.4 tons or about 55,000 pounds.

The maximum total draw-bar pull of the three Boston and Maine Railroad switching engines used was 78,000 pounds. The three engines hauled together but, in order that all three should not exert their pull through the coupler on the aftermost engine, this latter engine

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was run in a backing position and a special attachment used to connect the two hauling wires to its front bumper beam. Although a 2-part haul was used in order to complete the operation in one run of the engines, it was possible in the event of the vessel's sticking, and all necessary arrangements were made, to increase the total pull exerted by the same engines by stoppering one hauling part.

The total pull of the main hauling rig was transmitted to the ship by means of a bridle or doubled strap consisting of four parts of 2-inch diameter wire rope.

Connecting the hauling bridle to the hauling block

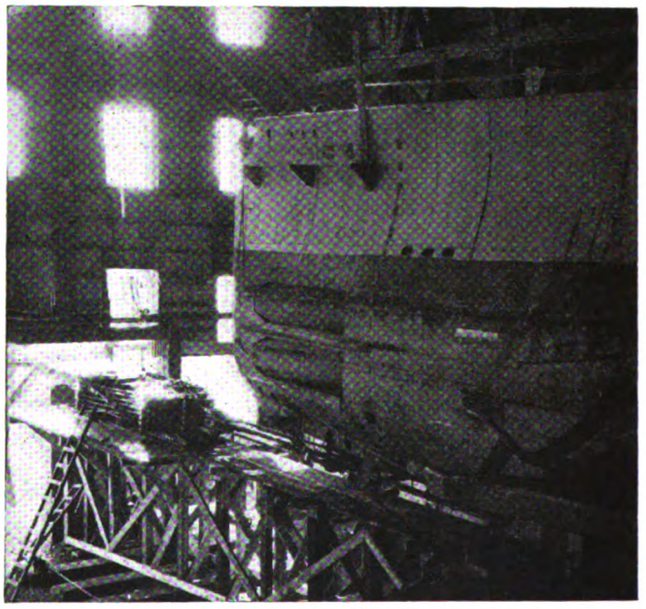
If the four parts were so arranged that the load on each would be equal, the factor of safety over the estimated pull of 121 tons would be 3.5. The two bights formed at the after end of this bridle passed around a 6-foot diameter thimble fixed horizontally between the two after sections of sliding ways, allowing easy rendering. The four parts then ran forward under the keel to a smaller thimble under the stem of the ship which could be quickly attached to the hauling block by a 5-inch diameter pin. The hauling block was so led out on the ways that, the ship having been hauled up the initial 15 feet by the crane drums, the thimble at the stem of the ship just met the hauling block, and the connecting pin was shipped, slightly below the surface of the water.

The main hauling blocks and the lead blocks were 4 feet in diameter. The hauling block itself rested on a skid on the lower cheek which ran over a 4-foot wide strip of plating laid out over the cross logs between the ground ways. The fixed block was anchored at the head of the ways by a structural steel girder which rose at a 40-degree angle from a concrete anchor block below ground level, its way end resting on a compression block and in line with the ways. This anchor was designed to withstand a pull of 121 tons.

At the head of the ways the street layout necessitated the two hauling wires changing direction about 48 degrees in the horizontal plane. Two single sheave lead blocks were, therefore, placed here, at heights of 15 and 13 feet respectively above the ground, so that the hauling parts should have a straight lead up the slope of the ground ways from the top and bottom sheaves of the moving block. A structural steel framework, bolted down to the main cement anchor block, was erected to anchor these lead blocks. Platforms of wooden construction supported the weight of these blocks in what was estimated to be the plane of the two leads of wire when under load.

After running 750 feet from the above lead blocks, the two hauling parts changed direction 90 degrees, where they crossed the railroad tracks at the start of the run, by means of a double sheave lead block. This block was held by a strap, running to an anchor in the ground, against a pull of 94,000 pounds.

After running 1,050 feet the track turned 30 degrees and it was necessary, during and after the rounding of this curve, that the hauling wires be restrained to lead practically in line with the engines, otherwise, derailment or splitting of the rails would be possible. For this purpose a snatch block was rigged which could be connected up on the run. At the point of attachment of the hauling wires to the locomotive, a wooden bracket frame was constructed to support a two-wire single



The S-48 hauled up in place at head of the ways with blocks fastened

sheave block, through which the ends of the two hauling wires were rove before attachment to the locomotive. This lead block was fitted with a strap 5 feet long. A locomotive crane, stationed on a siding which opportunely existed on the outboard side of the 30-degree curve, had its boom lowered to the ground and about parallel with the main track. At the boom end a double block was connected by a three-part fall, lying at right angles to the boom and in the direction of the main track curve, to a single block with a hook. This single block and hook lay on the ground just outside the curve and was located by experiment so that, as the engines rounded the curve, a man following close behind could slip the strap, from the lead block traveling with the engines, over the hook. The double block was stayed to the boom end to offset the pull of the hauling part which led along the boom to the hoisting drum and was also connected to an anchor in the ground, outboard

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and in line with the tackle, against the total pull of 38,000 pounds.

The arrangement functioned perfectly. As the locomotives traveled at a slow walking pace no trouble was experienced in making the lead block strap meet the hook. As soon as this connection was made the lead block pulled off the bracket on the locomotive and dropped to the ground. Its effective base had been increased by angle bar ribs so that it could not upend prior to being flattened out by the pull. The crane operator then hauled the lead block over so that the hauling wires pointed with the engines, changing this lead at will as the engines swung round the curve.

Several measures were available for holding the ship from sliding back in the event of any gear parting. Stopping the locomotives alone would, under ordinary conditions, hold the ship. In the event that the main falls, cradle bridle, or anchors parted, the falls of the two crane hoisting drums at the head of the ways had sufficient holding power. Stoppering the main falls would also serve to assist the cranes in holding in case any of the main hauling gear beyond the ways carried away. The crane falls were connected to the ship through padeyes on the hull independently of the main gear bridle. In the event that both the main hauling gear and the crane falls parted at once, or in quick succession, shores were fitted to the cradle so that the two pairs of dog shores themselves acted as pawls and the concrete cross caps under the ground ways acted as pawl teeth. The upper and forward end of each dog shore was backed up by a bolster, let into the packing of the cradle, and cupped and shod to receive the end of the shore. This end of the shore was hinged by means of a loosely fitting bolt through the packing. The lower and after end of each dog shore was beveled and shod to fit against the concrete caps. This end, once it was allowed to drop, rose and fell over each cross cap as the vessel moved up the ways. The after ends of these shores were held up clear of the ways by lines leading to the deck and were not dropped until the ship had progressed so far that the after end of the cradle would be accessible at mean low water and launching back was not necessary.

The officer in charge of hauling, after coming ashore from the ship, carried a portable telephone set which communicated with the personnel at each important point along the line. One set on this circuit was carried in a small truck which kept abreast of the leading lomomotive, the telephone wire having been led out halfway down the track and doubled back to the starting point.

Actual Hauling Operations

Operations began at 9:15 A. M. on February 3. The *S-48* was centered over the ways, brought ahead to the main hauling block, and connected to it without difficulty. Two divers reported on the alinement of sliding and ground ways. A first haul by the locomotives was started at 11:32 A. M. and stopped one minute later, after the ship had travelled 15 feet. Reports showed that pivoting had ceased and the ship had come out of water sufficiently to drop the lead ballast and start blowing the after tanks without danger of the stern lifting again. The engines again started ahead at 11:38 but were stopped two minutes later in order to shake out the slack in the main falls, the load not being sufficient to do so up to this point. The true haul was then started at 11:46 and completed at 12:02, the distance traveled by the ship in this time being 288 feet, average speed 17.9 feet per minute, maximum speed 30.6 feet per minute.

Conclusion

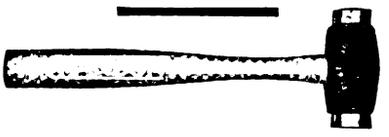
Although a special arrangement for a special task, the above operation, modified to suit local conditions, might well serve in the undertaking of extended out-of-water work on any vessel of moderate tonnage, to avoid an excessively long occupancy of working dry docks or marine railways. Packing a sliding ways to a hull in dry dock permits the use of a much shorter underwater section of ways, saving the cost of extension of ways and also obviating the construction of the more complicated type of independent marine railway cradle. All foundations, anchors, and hauling gear are available for a repetition of the operation should the necessity arise.

The use of railroad locomotives, on a much larger scale, for general hauling and wrecking operations seems entirely practicable. They provide a cheap and mobile source of power, provided there is existing trackage sufficiently long and free from sharp curves to suit a practicable rigging of gear.

A Soft-Faced Hammer

A SOFT-FACED hammer made especially for use on finished parts, gears, sprockets, bronze, aluminum and nickel plated material is being manufactured by the Illinois Iron & Bolt Company, Carpentersville, Ill., under the trade name "Chanson."

The illustration indicates the features of the hammer, which consists of a steel body and two metal plugs constituting the hammer faces. These plugs are preferably of copper, although lead babbitt or steel plugs may be used. In some cases where it is found advantageous one plug is of steel while the other is of a soft metal, thus providing a double purpose hammer at no additional cost. The body of the hammer is provided with a slanting hole leading from the middle section to the side to facilitate the removal of the plugs when necessary.



"Chanson" soft-faced hammer

This type hammer is made in five sizes ranging in weight from ¾ pound to 8 pounds, with handles from 10 inches long to 24 inches long.

Boilers of the S. S. Orford

By G. P. Blackall

ONE of the finest vessels built in Britain this year is the *Orford*, the new 20,000-ton Orient liner, which was recently completed by Vickers-Armstrong, Ltd. The liner is propelled by twin screws driven by two sets of Parsons turbines, developing 20,000 shaft horsepower, which give the vessel a speed of 20 knots.

The steam generating installation consists of six double ended and two single ended boilers of the ordinary multitubular, return tube type arranged in two compartments, working under Howden's system of forced draft and designed for a working pressure of 215 pounds per square inch. All the boilers are of 16 feet 6 inches mean diameter, while the length of the double ended boilers is 21 feet 9 inches, and that of

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the single ended is 11 feet 2 inches. Each double ended boiler is fitted with six separate furnaces of the Morison suspension type and has six combustion chambers. The single ended boilers have three furnaces and the same number of separate combustion chambers. The total heating surface is 46, 530 square feet. The boilers are arranged for oil burning only. The Wallsend-Howden oil burning system is installed with two main sets of pumping and heating equipment. The auxiliaries are practically all electrically driven.

Speed of Double-Ended Ferry Increased by Disconnecting Bow Propeller

WISHING to speed up the 70-car motor ferry *Point Defiance*, Frederick Lonning, chief engineer of the Skansie Shipbuilding and Dry Dock Company, put in a clutch at each end of the engine so that the ferry is now driven by one propeller while the one at the bow end of the vessel idles. As result of the innovation the boat has picked up nearly five minutes in a four-mile run.

Previous to the change the shaft was solid from propeller to propeller and both wheels turned. With the new rig it is much easier to handle the ferry as there is no danger of the Diesel refusing to reverse while the boat is going into dock, as happened a number of times with the solid shaft when it was necessary to reverse the engine. With the clutches the engineer keeps his engine running at about half speed and uses the bow propeller to reverse. When the rack of the clutch gear is on center both clutches are open and both wheels idle.

When the clutches were installed the propellers were changed from 69 inches diameter and 48 inches pitch to 74 inches diameter and 52 inches pitch. The engine has been tuned up to run at 260 revolutions per minute and at that rate is consuming an average of 15 gallons of fuel oil per hour.

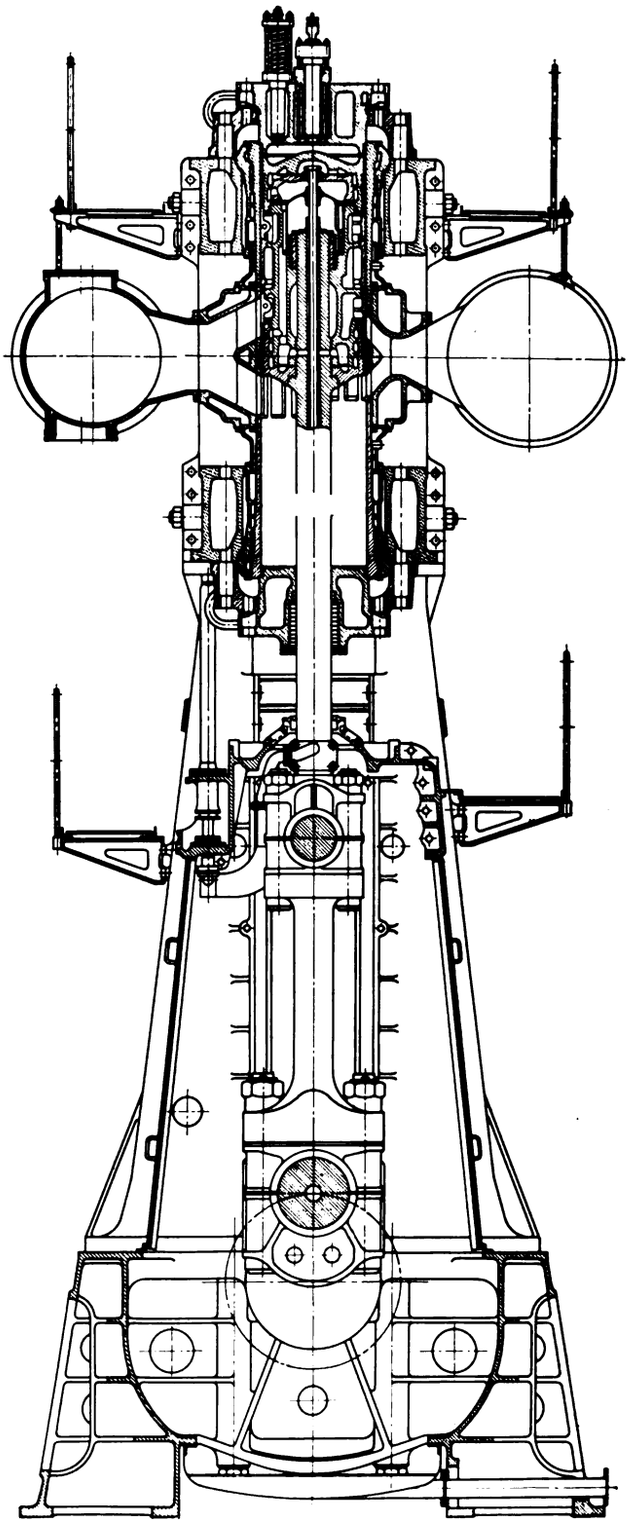
First Airless Injection, Double Acting Engine

By Our London Correspondent

AS THE first large airless injection engine of the double acting, two stroke Diesel type to be installed in a ship, the 6-cylinder unit which has recently been completed at the A. E. G. works in Berlin marks a new step in the development of the internal combustion engine as applied to marine work. It is now being installed in a 10,000-ton cargo ship, one of three vessels, which the Hamburg-Amerika Line is building for its Far Eastern service.

This motor, which is built on the Hesselman system of fuel injection, is designed to develop 4,500 brake horsepower, at 90 revolutions per minute in normal service, but has to record 6,000 brake horsepower at 120 revolutions per minute. It has six cylinders 700 millimeters in diameter with a piston stroke of 1,200 millimeters and gives an impression of extreme simplicity, for the 12 fuel pumps are all timed and the fuel is delivered to the valves automatically. In other words, no mechanical operating gear for the valves is needed, and there is no cam shaft nor valve levers for the actuation of the valves.

At the top of the cylinders, in fact, there is only a single valve, namely that for the admission of fuel, apart from the relief valve, for a starting valve is only fitted in the bottom cover. In this cover is also the single fuel valve, but it has pipes leading to 10 different sprayers, since the fuel is sprayed in this manner in the combustion chamber. At the top there is a single



Cross section through cylinder of Hesselman—A. E. G. engine

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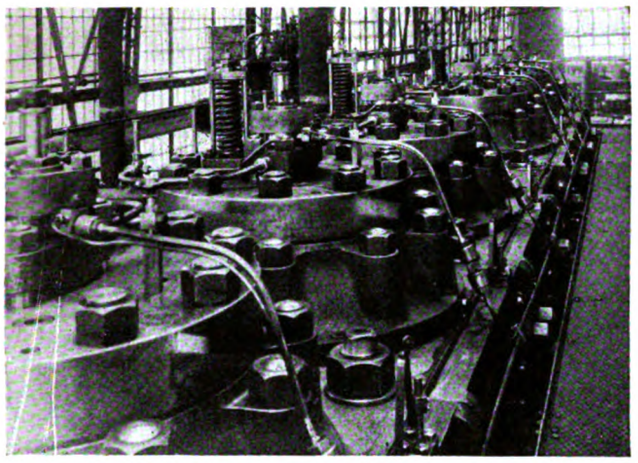


Top of Hesselman-A. E. G. engine

sprayer with several holes so that the fuel is spread out in the cylinder after injection.

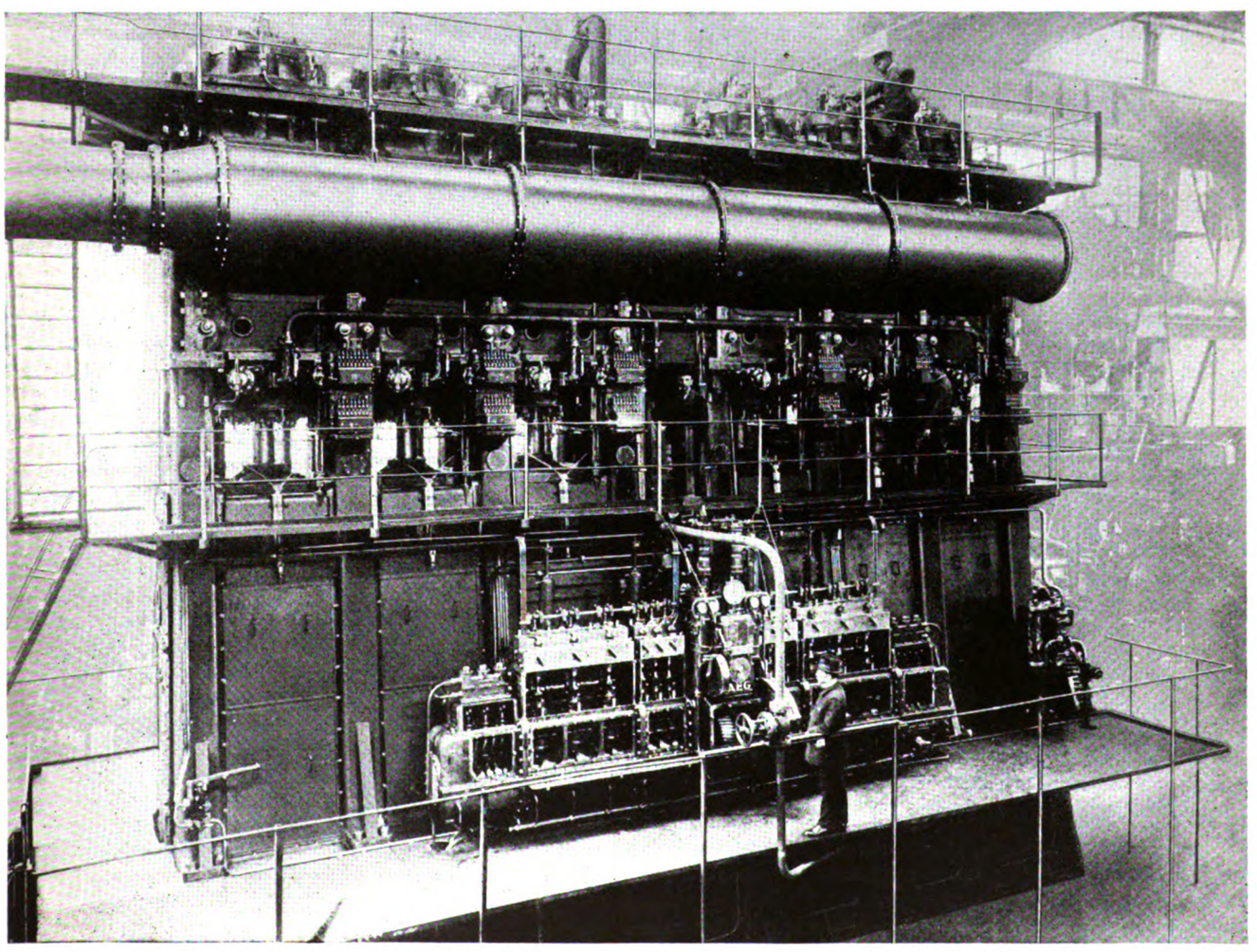
The fuel pumps are driven by skew gearing from the center of the crank shaft, and scavenging air is supplied from an electrically-driven blower.

New Cylinder Construction

The cylinder construction is somewhat new. At the top and bottom are separate entablatures, carrying in each case, the cylinder jackets. Within this and supported by it is the cast iron liner with a narrow flange at the top. The entablatures are bolted together in the case of adjacent cylinders so that the group of 3 cylinders is tied together rigidly. Through bolts extend from the bottom of the bed plate to the top of the upper entablature, to which the cylinder covers pressing down on the liners are attached. The combustion chamber is curiously shaped, the piston being domed in the center; this system is employed as giving the most effective combustion, according to the designers.

It is claimed that this engine will give a lower fuel consumption than any two stroke, double acting engine on the market, and a figure of 0.38 is stated to be possible in normal service. As this represents a saving of 5 percent compared with most other engines, the point is not without importance. Four cycle, single acting engines operating on the same principle are installed for driving the dynamos, and it is believed that the first vessel to be equipped with this plant will be one of the most economical ships in service.

OCEAN MAIL ROUTES.—Acting under the provisions of the Jones-White merchant marine act, Postmaster General New has addressed a communication to the Chairman of the United States Shipping Board certifying seven ocean mail routes which should be established or operated for the carrying of mails as contemplated by the act. These routes are already under contract but the Postmaster General desires that they be included under the provisions of the new act.



4,500 to 6,000 brake horsepower Hesselman-A. E. G. engine of the double acting, two stroke, airless injection type

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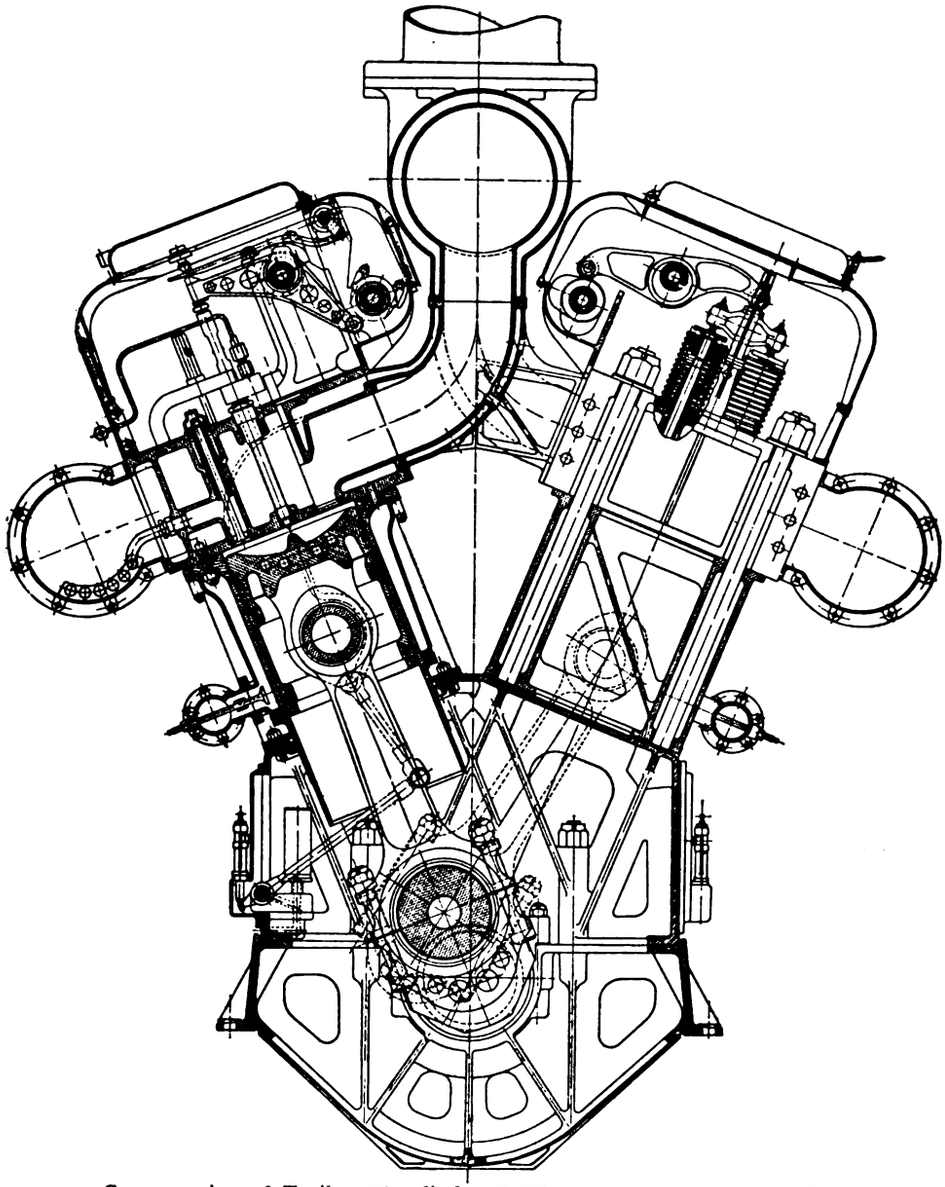
V-Type Light Weight Diesel Engine

Treiber Diesel Engine Corporation builds 3,000 horsepower unit weighing 63,200 pounds — Fuel consumption 0.372 pound per brake horsepower hour

WITH the recent completion of the first of two high speed, light weight Diesel engines for installation in a 40-mile an hour express yacht for Carl Fisher of New York, the Treiber Diesel Engine Corporation of Camden, N. J., has definitely entered the field of marine engine construction. This engine was built by the Treiber Corporation at the shipbuilding plant of the American Brown Boveri Electric Corporation, Camden, N. J.

Features of Engine

The engine, which is of the 12-cylinder V-type, weighs 63,200 pounds and in test developed 3,000 horsepower with a fuel consumption of 0.372 pound per brake horsepower hour at 85 pounds brake mean effective pressure. The cylinder diameter is 16 inches and the stroke is also 16 inches. The engine operates on the 4-cycle principle and is fitted with dual valves driven through gearing by a set of overhead cam shafts for each bank of cylinders. The fuel oil system is of the constant pressure solid injection type, the fuel pumps being driven through gearing by the main engine.



Cross section of Treiber 12-cylinder, 3,000 horsepower, V-type engine

The Treiber engine is direct reversible and the control, including starting, stopping, reversing and accelerating, is accomplished by the motion of a single wheel. Interlocking devices prevent movements out of the regular timing order. Reversing is done with compressed air by admission into a ram. This ram motion raises the rocker arms from the cam shaft and slides the cam shaft endwise, later returning the rocker arms onto the set of reverse cams.

The crank shaft is a solid forging of chrome vanadium steel, heat treated. It is hollow bored and carefully machined to a nice finish and close tolerances. The framing is of cast steel, while the cylinders are of forged alloy steel, heat treated to 275 Brinell hardness and lapped to size. The cylinder heads are of copper aluminum alloy which has been heat treated. The liners are bolted to the heads and the water jackets, also of the same copper aluminum alloy, are bolted to the liners. The heads are supported from the center frame by aluminum alloy columns through which alloy steel tie rods pass to secure the cylinder heads. The heads are bolted together fore and aft, making a secure and substantial structure.

The bearing construction is a departure from the usual Diesel engine bearing practice. The main bearing shells are of forged steel lined with 3/32 inch of bearing metal, but no anchor grooves are used. The crank bearing shells are also of forged steel, lined with 1/16 inch of bearing metal, no anchor grooves being provided. The connecting rods are of chrome vanadium steel, heat treated to meet high physical tests and machined to H-section. They are of the fork and blade type with the blade rod accelerating on a plastic bronze bearing fused to the crank bearing shell.

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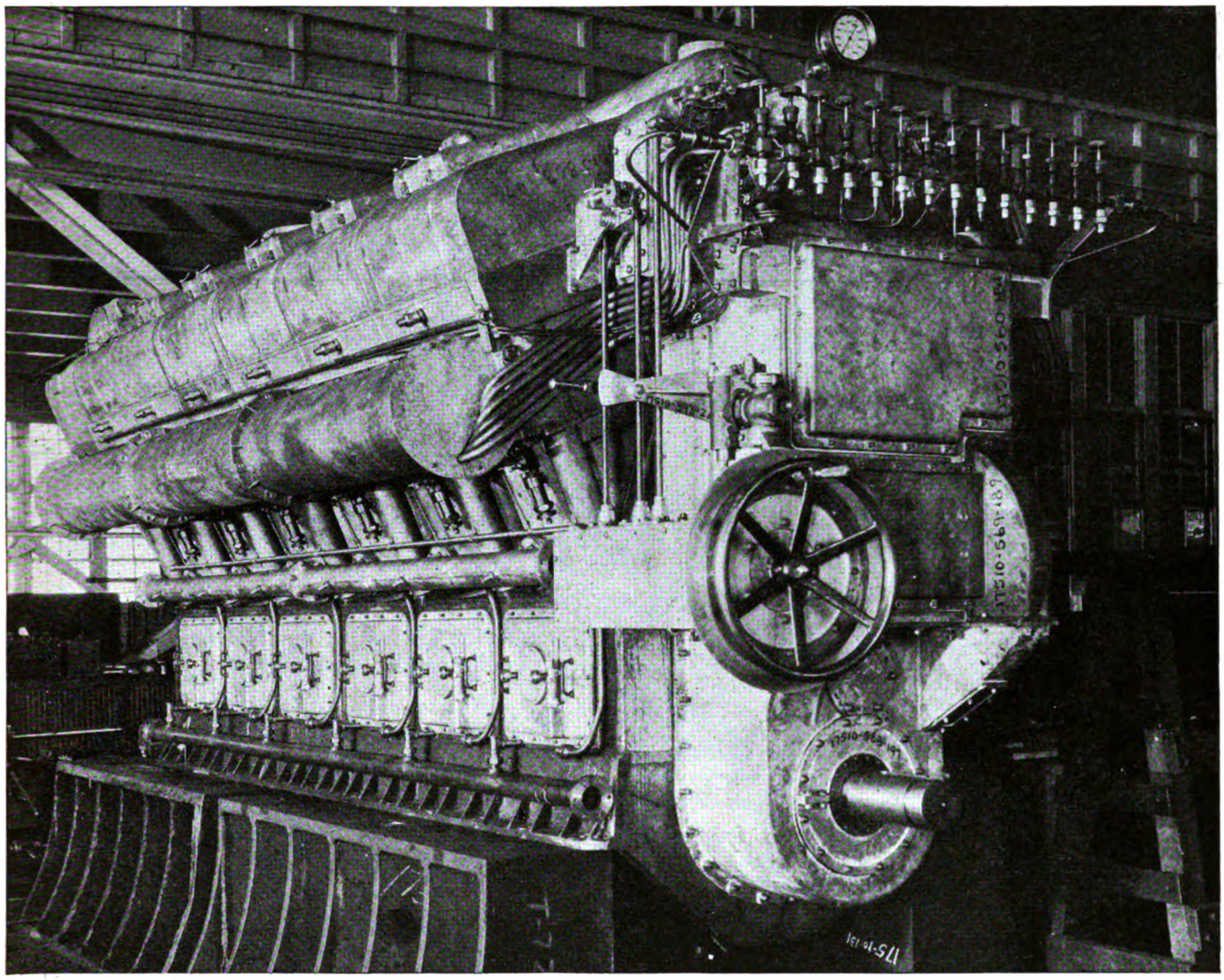
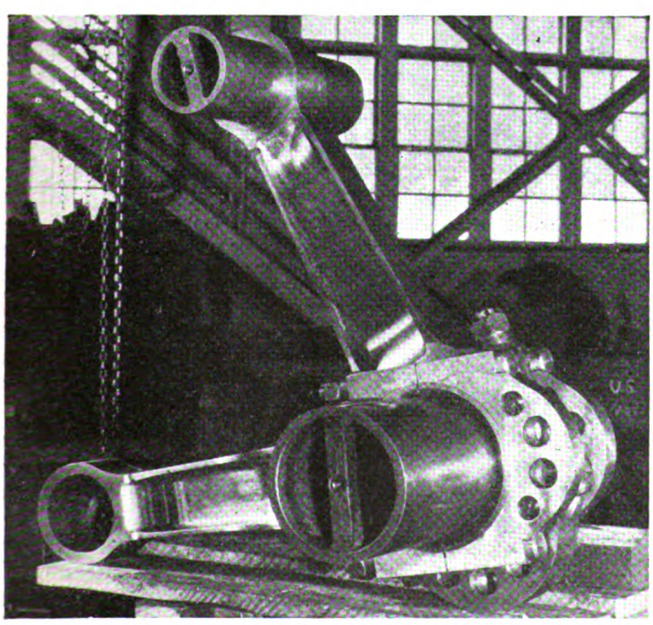


12-cylinder, V-type, light weight, high speed Treiber engine designed to develop 3000 horsepower at 700 revolutions per minute: Bore, 16 inches; stroke, 16 inches

Forced feed lubrication is used throughout, no parts being left for hand oiling. The top is enclosed and drained for a full return lubricating oil system.



Connecting rods

The gears are spiral spur and spiral bevel, mounted in Timken roller bearings and steel brackets. The gears are case hardened and accurately ground which results in almost noiseless operation. The gears are lubricated by jets of oil directed into the mesh of each pair of mating gears.

Aluminum Alloys Used Extensively

All housings and covers are made of aluminum alloy except the flywheel cover which is cast steel on account of the heavy stresses imposed upon it by the connection to it of the jacking-over mechanism and a pneumatic brake for stopping the crank shaft quickly. This brake is operated within the flywheel whenever the control wheel is within 15 degrees of top center which is the stop and reverse position.

The pistons are of nickel aluminum alloy with coils cast into the crowns through which cooling oil is circulated under pressure during operation of the engine. The piston and rod assembly is shown in the illustrations. The rocker arms are mounted on the heads and the cam shaft is sufficiently offset to permit the removal of heads, cylinder liners and pistons without disturbing the cam shaft or its bearings.

The exhaust passages and the exhaust manifold are made of copper aluminum alloy. The advisability of using light weight metal was given exhaustive study during the early stages of design, particularly as to the

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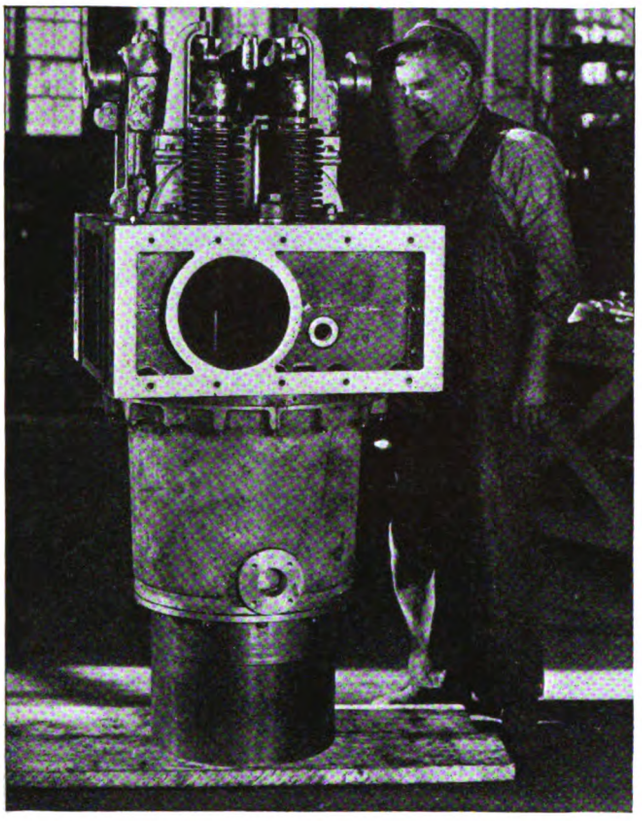
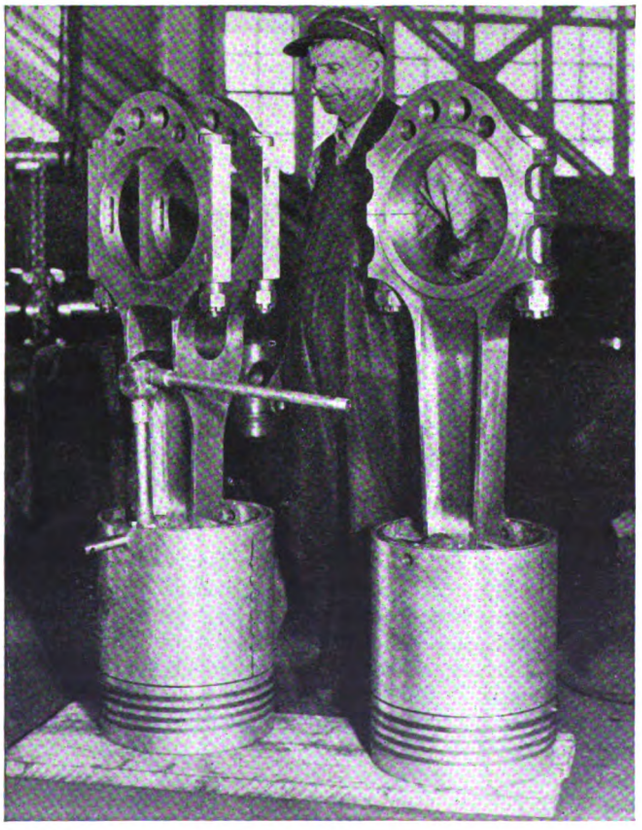


Cylinder

probability of electrolytic action. It was found that corrosion was approximately 1/20 that of cast iron and the electrolytic action was stopped when in contact with anodes or cathodes after 2 to 3 hours immersion. During this period an aluminum oxide coating was found to build up on the aluminum which prevented further action. After a 3-year test of this alloy in a salt water cooled engine, the castings showed the metal to be as sound as when cast. Of course when there are no anodes or cathodes in the bath there is no action, so this engine was built without anodes or cathodes in the circulating system. Provision is made to bring water to and discharge water from the engine through rubber tubing. This feature is always good practice to follow in designing any high speed marine engine. The outside surfaces of the cylinder liners are covered by copper aluminum by means of the Schoope process.



Pistons and connecting rods

The thrust bearing is of the roller type with double self-alining washers and is full floating, carried in a cast steel housing.

A great number of dies were made to permit drop forgings for such parts as inlet rocker arms, exhaust rocker arms, spray valve rocker arms, valve yokes (the latter are of duralumin), fuel pump parts, and the like. An interesting item is the total absence of cast iron—not an ounce of cast iron being used in this engine.

It is stated by the builders that the use of such engines in Diesel electric driven cargo ships offers an interesting solution to many motorship problems. The first cost can be low on account of the high speed and the flexibility far in excess of any other type of motorship drive.

This type engine is claimed to be suitable in sizes of from 2,000 to 3,000 horsepower.The Treiber Corporation is also completing a number of smaller size light weight engines details of which will be published later.

Sea Trials of M. S. Wilscox

ON her sea trials, which were run in lower Boston harbor on April 18, the Shipping Board converted motorship *Wilscox* maintained a speed of 13 knots during her full power run, exceeding by ½ knot the contract requirements. The main engine ran without vibration through all ranges of speeds, and on her six-hour run developed full power at 115 revolutions per minute. Forty-six maneuvers were made going alongside her pier, using air from only one starting tank which was not being replenished during maneuvers.

The *Wilscox* is a cargo vessel of 13,010 tons displacement and 9,235 tons deadweight capacity at a normal load draft of 26 feet 10¾ inches. She is 416 feet long overall, 402 feet long between perpendiculars, 54 feet molded beam and 33 feet 9 inches molded depth. The vessel was converted from steam to Diesel drive at the Fore River plant of the Bethlehem Shipbuilding Corporation, Ltd., the main engine consisting of a four-cylinder, double-acting, two-cycle, air injection Nelseco engine supplied by the New London Ship & Engine Company, Groton, Conn., licensees of the M. A. N. of Augsburg and Nuremburg, Germany. The engine, with cylinders 27.55 inches diameter and 47.24 inches stroke, develops 3,680 brake horsepower at 115 revolutions per minute. This is the largest marine two-cycle, double-acting engine built in the United States to date. A description of the engine, with data from a 30-day non-stop shop test, was published on page-41 of our January, 1928, issue.

The cost of conversion of the vessel amounted to $853,400, of which $413,000 was for installation and special alterations, $253,500 for the main engine, the remainder being for deck and engine room auxiliaries, equipment and outfit and incidental expenses. The

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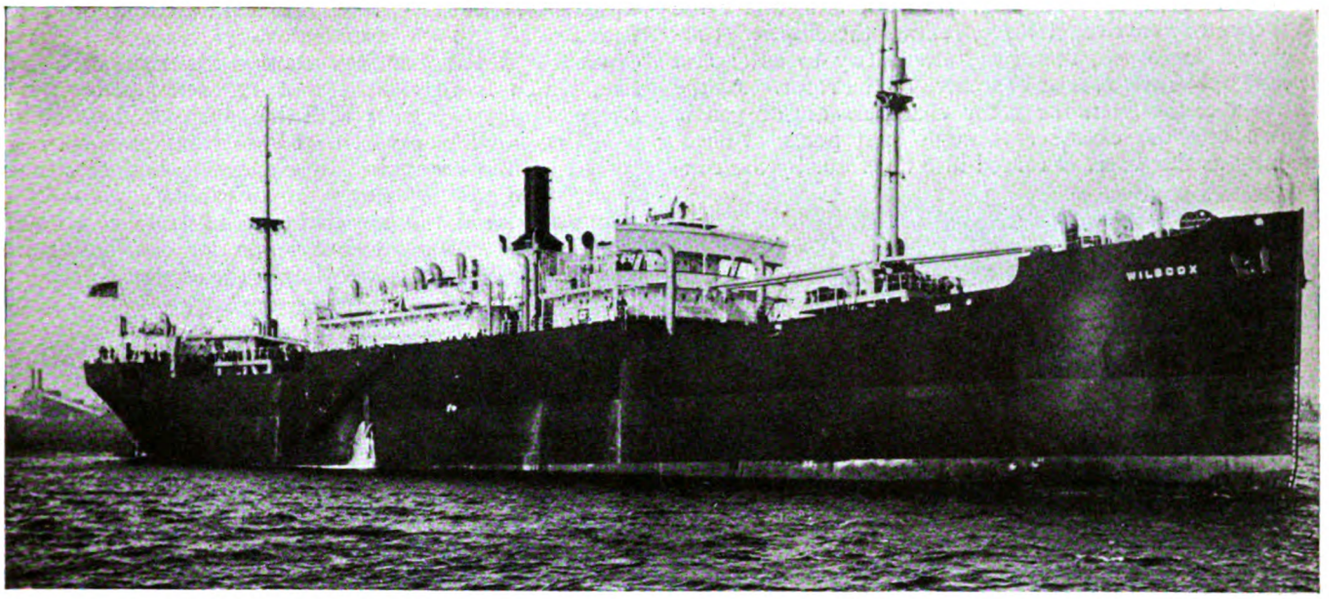


Shipping Board converted motorship Wilscox

auxiliaries included three 115 brake horsepower Worthington single acting, two-cycle, air injection engines, each coupled to a 75-kilowatt Ridgway generator; one 22 brake horsepower Mianus engine driving a 14-kilowatt Diehl emergency lighting generator and a Rix compressor; eight Nash centrifugal water pumps, driven by General Electric electric motors ranging from 7½ to 30 horsepower; three Kinney rotary oil pumps, driven by General Electric motors; one 2-ton York ammonia ice machine, and two fuel oil and one lubricating Sharples oil separators.

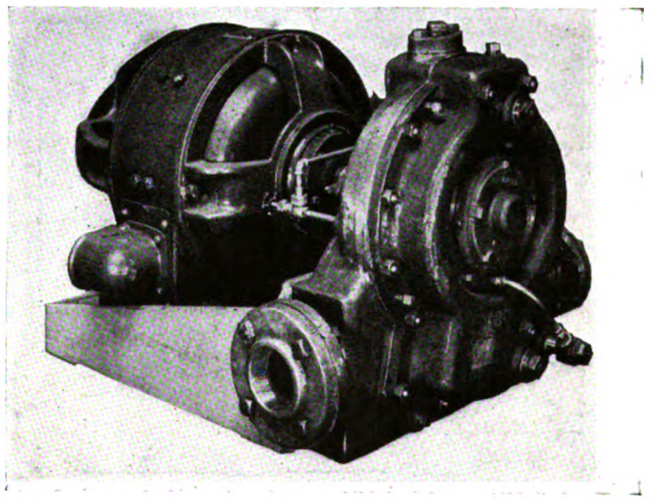
The *Wilscox* has been allocated to the American Republics Line, operated for the Shipping Board by C. H. Sprague & Son, of Boston. She will trade between the United States and South America.

A Self-Priming Marine Pump

THE Nash Engineering Company of South Norwalk, Conn., has introduced the Jennings suction centrifugal pumps to the marine field. These pumps, originally developd for the United States Shipping Board in connection with the first Diesel conversion program, have found favor in the marine field as a whole because of their self-priming feature, their compactness and general efficiency. In view of this a second contract for 48 of these pumps has been awarded to the Nash company in connection with the current Diesel program of eight vessels of the Shipping Board and pumps have been supplied also to the Atlantic Refining Company, to several more recently built yachts and to small vessels of the tug boat and dredge type.

As shown in the illustrations, the motor and pump are mounted on the same base. The pump and motor are an integral assembly, all moving parts being mounted on the motor shaft. This eliminates the conventional pump bearings and requires only a single stuffing box. A standard ball bearing motor of either Westinghouse or General Electric manufacture may be readily and quickly mounted, the bearings being of the deep groove type for radial and thrust load.

In order to compensate for any deviation in the location of the motor shaft, special floating sealing rings not only prevent leakage from the discharge to the suction side of the impeller, but automatically aline themselves with the rotating parts. The pump shaft is bored to a drive fit on the motor shaft and is keyed to the motor shaft with a set screw at 90 degrees. This solid connection of pump and motor gives the utmost compactness, obviates the use of a flexible coupling and results in extreme simplicity which is so desirable on board ship.



The 2-inch Jennings suction centrifugal pump

The centrifugal pump itself consists of a single suction, enclosed impeller. The exterior of the impeller is accurately machined. The interior is thoroughly smoothed to give the highest efficiency. The suction and discharge passages of the pump are also carefully smoothed.

The self-priming feature of this pump eliminates the usual foot valves, hand pumps or air pumps that are customarily required to prime the centrifugal pump. The air pump, consisting of a single revolving element, is mounted on the same shaft as the motor and the water pump impeller. This air pump rotor is circular with a number of blades around its periphery. The casing in which it revolves is elliptical. Water admitted

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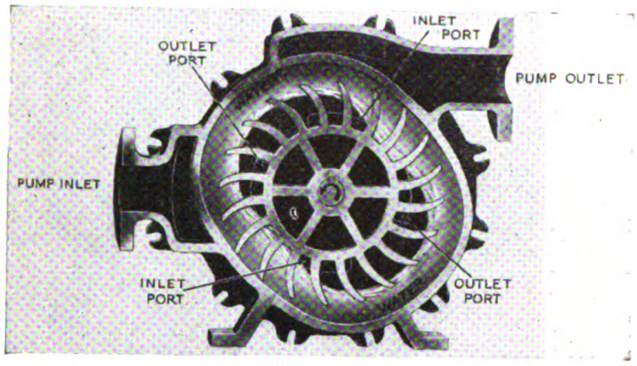
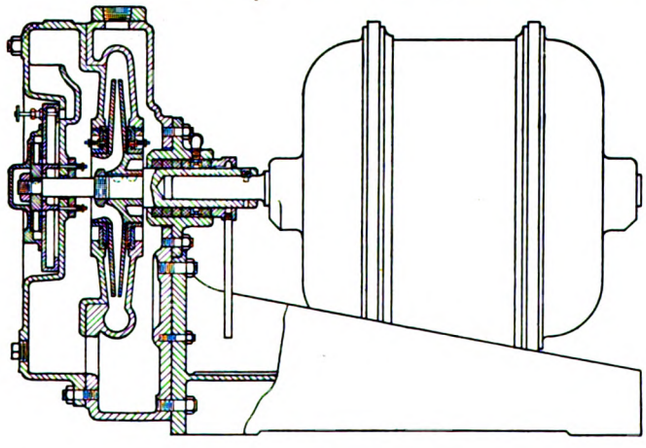
into this casing revolves with the rotor and, under the influence of centrifugal force, follows the elliptical contour. It is forced, therefore, alternately to enter and leave the blade spaces or chambers of the rotor. As the water recedes from the rotor chambers air or gas is drawn into the chamber through inlet ports. Subsequently as the water is forced into the rotor by the converging casing this air or gas is compressed and discharged through outlet ports.



Cross section of the vacuum pump showing principle of operation. Rotation is counter clockwise

This unique principle of operation of the vacuum pump makes it especially applicable to priming a centrifugal pump because the air pump is not harmed by any water which may be carried over during the priming operation. Furthermore the rotor is the only moving part and this revolves without contact in its casing. There are, therefore, only two revolving elements in the entire pump, the water impeller and the air rotor, both rotating without contact. This feature makes the unit entirely dependable and gives it long life.



Sectional elevation, showing the air rotor, pump impeller and motor armature all mounted on the same shaft

After the centrifugal pump is primed the small amount of water which is discharged with the air from the air pump is thrown back into the bilges; a needle valve restricts this amount of water to a small stream. Provision is made in the pump structure to insure storage of sufficient sealing water for the air pump for subsequent operations and through this provision the unit may operate intermittently without attention.

The simplicity of the design and the fact that one set of bearings is eliminated, together with the fact that the clearance between all moving parts and the casing is ample, make for a high grade, efficient and dependable equipment. These pumps are manufactured in sizes with 2- 3- 4- and 6-inch diameter suction pipe. The type described is the Jennings suction centrifugal, 2-inch size, which is the smallest of the self-priming type. Larger units are similar with the exception that the air pump is mounted on its own shaft and bearings supported by the centrifugal pump casing and connected to the main shaft by means of a coupling.

In all cases the pump head may be detached without breaking the major pipe connections or distributing the alinement of the pump and motor in any way.

The Diesel Electric Freight Boat Edward F. Farrington

THE new steel Diesel electric freight boat *Edward F. Farrington,* owned by the Middlesex Transportation Company, of New Brunswick, N. J., recently had its trial trip in New York harbor, upon its arrival from Quincy, Mass., where it was built by the Bethlehem Shipbuilding Corporation from the design of Eads Johnson, M. E., Inc., New York.

The hull is built entirely of steel with steel freight house on the main deck, the forward doors of which are of the rolling type—a novel feature and a splendid adaptation of the type of door so long used ashore, where maximum clear opening and complete housing are necessary. The vessel is 130 feet long overall, 120 feet long on the waterline, 30 feet beam, 12 feet deep and carries 100 tons of freight on 7 feet 6 inches mean draft.

The Diesel-electric freight boat Edward F. Farrington

Her machinery, controlled entirely from the pilot house, consists of two 250 brake horsepower Winton Diesel engines, direct connected to two 165-kilowatt generators and two 15-kilowatt exciters.

The propelling motor is of the double armature type, controlled on the Ward-Leonard system, designed to develop 400 shaft horsepower. All electrical units were furnished by the General Electric Company. The steering gear is electrically controlled by a Cutler-Hammer helm angle follow-up type controller, mounted on a brass pedestal in the pilot house. A hand gear is also installed and is of the Eads Johnson immediately controllable type design. A Lidgerwood double drum, electrically driven, cargo hoist, operated by control levers in the pilot house, is located in the forward hold.

There are two fuel tanks of a combined capacity of 4,000 gallons, which will give at least 200 hours full power service. An auxiliary Diesel generator set, air compressor, bilge and fire pumps and one motor-driven fresh water pump complete the machinery installation. Heat is furnished by an American Radiator Company steam boiler, fitted for oil-burning. The Valjean carburetor burner is used.

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Arrangement of Bunkers and Equipment for Pulverized Coal Burning Ships

By Edwin B. Sadtler*

FIG. 1 shows the bunker and fire room arrangement of a pulverized coal burning ship of about 50 feet beam and 30 feet depth to main deck, which are average dimensions for a 6,000 to 7,000-ton deadweight vessel. The coal is dumped into a hatch located on the centerline of the ship just forward of the stack, so arranged that the bunkers will be completely self-trimming when taking in fuel. The bunkers, as shown in the longitudinal and cross sections, extend between the boilers. The top of the bunker is angled out over the boilers to a width of 36 feet and narrowed at the bottom to feed a Peabody combined feeder, crusher

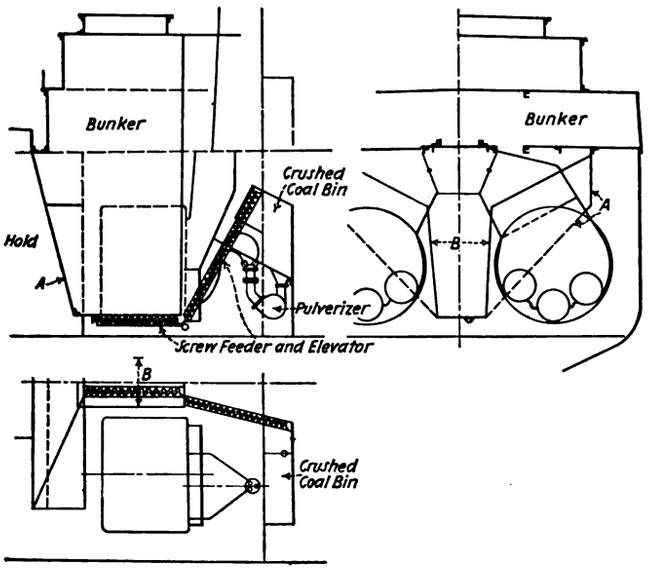

Fig. 1.—Proposed arrangement of bunkers and fire room equipment on pulverized coal burning vessel

and elevator on each side of the center. The uptakes and air heaters are placed on an angle and each side is fitted with a damper to prevent dust settling in either side that may not be in use.

The feeders have an elevating screw, discharging the crushed coal into a bin, shown on the plan (Fig. 1), which feeds by gravity to the pulverizer under same. The bunker can be increased in size by extending it into the hold as shown, this portion also being arranged to trim by gravity to end of the feed screws.

The crushed coal bins are arranged with a space between them in the center of the engine room, sufficiently wide to accommodate the forward end of the engine and to give a passage around the end of the engine.

The pulverizers are located as low as possible and discharge as shown through an adapter into the distributors and thence to furnaces. This arrangement gives the shortest possible length of coal piping, and places all operating parts on one level so that one man on the fire room floor can handle everything with ease.

Removing the coal from the sides of the ship means keeping it clear of the frames or other obstructions which make it difficult to trim and give an absolutely self-trimming bunker.

By placing the fire room next to the engine room, fan ducts will be shortened and the engineer will have ready access to the fire room and be better able to keep an eye on the operation of his fire room auxiliaries.

Fig. 1 is only a typical sketch, but it lends itself to ready adjustment for different conditions and arrangement of fire room. The entire system is better understood by referring to Fig. 2 in which a different arrangement of the bunkers and equipment is shown. In this

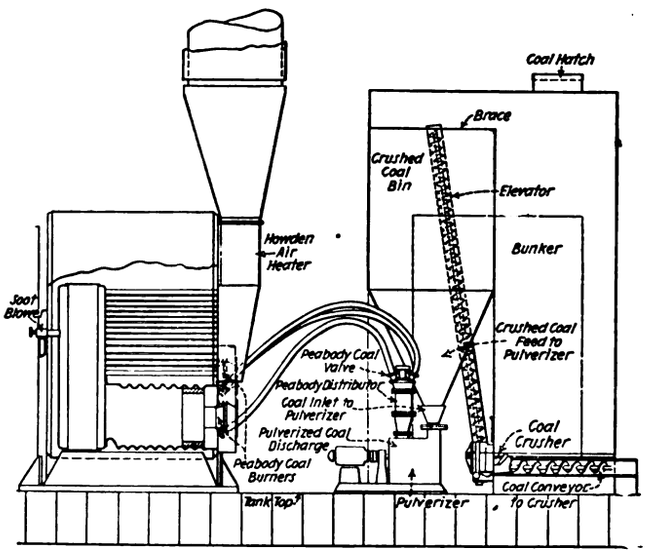

Fig. 2.—Longitudinal section through fire room showing proposed arrangement of pulverized coal burning equipment

arrangement, however, the operations are the same. The coal is taken aboard through a hatch in the deck, trimming directly to the screw feeder and crusher, then elevated to a crushed coal bin over the pulverizer. The crushed coal is fed by gravity to the pulverizer and discharged directly to the distributor and thence to the burners at each furnace.

After passing into the furnace, the products of combustion pass through the back connections and tubes to the uptakes and air heaters, thence to the stack. Heated air is led to the pulverizers with the result that the coal is dried and the lighter parts are taken off.

Savings

As the usual fire room crew on a ship having three 3-furnace boilers is 6 firemen and 9 coal passers, this installation permits a reduction of the fire room crew to 3 firemen and no coal passers, resulting in a saving of 12 out of 15 men or 80 percent of this crew. This saving, in addition to the saving of approximately 15 percent of the fuel and the increased efficiency due to the steady steaming given with pulverized coal, instead of the usual variations caused by hand firing, will show greatly improved economy in the operation of the vessel.

A saving in expense when building coal bunkers and reducing the cost of installation is also effected. Should the vessel be intended for short coastwise trade between regular ports, arrangements could be made to bunker with crushed coal, thus eliminating the crusher, elevator and crushed coal bin. Only a feeder to deliver the coal to the feed hopper of the pulverizer would be required. This would make a further reduction in the cost of installation.

* Peabody Engineering Corporation, 114 East 42nd Street, New York.

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J. W. Owens Awarded First Prize of $10,000

JAMES W. OWENS, director of welding of the Newport News Shipbuilding & Dry Dock Company, Newport News, Va., has been awarded first prize of $10,000 in the Lincoln Arc Welding competition, for a paper entitled, "Arc Welding: Its Fundamentals and Economies," a treatise on arc welded design and shop practice and an analysis of its industrial applications and world wide possibilities. Mr. Owens became prominent in the field of welding in April, 1918, when he was appointed a member of the welding Committee of the Emergency Fleet Corporation. In September of the same year he was assigned as welding aide at the Norfolk Navy Yard where he was associated until 1926 when he was appointed director of welding at Newport News Shipbuilding & Dry Dock Company. Mr. Owens is the author of the book, "Fundamentals of Welding—Gas, Arc and Thermit." He is member-at-large of the American Bureau of Welding and was vice-president of the American Welding Society from 1920 to 1922.

James W. Owens

Henri Bustin, professor of applied science at the University of Brussels, Belgium, was awarded the second prize of $5,000 on a paper which bore no title.

The third prize of $2,500 was awarded to Commander H. E. Rossell of Annapolis, Md., on a paper entitled "Electric Welding of Ships' Bulkheads and Similar Structures."

Fred B. Walker of Winthrop, Mass., and B. K. Smith of Houston, Texas, received honorable mention on their papers, entitled respectively, "Theory of the Application of the Base Plate to an Arc Welded Rail Joint" and "Stable Arc Welding on Long Distance Pipe Lines."

The Lincoln Arc Welding prizes, given by the Lincoln Electric Company of Cleveland, Ohio, and placed in the custody of the American Society of Mechanical Engineers, were awarded at the spring meeting of the American Society of Mechanical Engineers at Pittsburgh, Pa., on May 14 by Alex Dow, president of the society.

The purpose of this competition was to encourage improvement in the art of arc welding, the pointing out of new and wider applications of the process, or the indicating of the advantages and economies to be gained by its use.

The judges of the Lincoln Arc Welding prizes were as follows:

Chairman—L. P. Alford, editor of Ronald Press.

S. W. Miller, Union Carbide & Carbon Corporation, Research Laboratories and American Welding Society.

Prof. Comfort A. Adams, Harvard Engineering School.

Henry Goldmark, American Society of Civil Engineers.

Dr. George Burgess, Director of Bureau of Standards, Department of Commerce.

Prof. Robert Fernald, Department of Mechanical Engineering, University of Pennsylvania.

Dr. W. F. Durand of Stanford University, past president, American Society of Mechanical Engineers.

Use of Powdered Coal as Fuel on River Towboats

By F. C. Moyer

FROM articles appearing in the various technical journals pertaining to marine repairs and, in some cases, non-technical publications, it becomes most evident that there exists, in the minds of some people, the belief that the solution for the water-borne transportation problem lies in the adoption of a fuel that will be far cheaper than any used in the past. Further, the idea seems to be prevalent that powdered coal will be the answer.

The writer has no desire to create the impression that the use of powdered coal in certain types of marine boilers afloat is an engineering impossibility. While small furnace volumes must be encountered in such cases, experience indicates that the turbulent type of burner will overcome this handicap. The selection of suitable pulverizers, and their arrangement, is not difficult. Further, there may be grounds for the belief that powdered coal can be adopted, with practical benefit, on ocean freighters and bulk lake carriers. The latter type of vessel has a number of stoker fired installations, which have proven successful. The steam requirements of such vessels is practically constant over long periods, and manoeuvering is not of a serious nature and constitutes a small percentage of the total operation of the vessel; however, some cargo space would be sacrificed to make possible the installation of coal conveying and pulverizing equipment. This would affect the earning capacity of the vessel.

Requirements for Towboat Service

For river towboat work, the adoption of powdered coal is handicapped by conditions of installation and operation, which make it doubtful whether any real commercial benefits could be realized. This is explained by setting forth conditions existing in towing work on the Mississippi river and its tributaries.

The channels are constantly changing, due to varying stages of water. The river is practically a series of bends. At high water stage the current becomes extremely swift in the bends and contrary to general belief, landings are not available at any place they might be desired. Much maneuvering is necessary and this in restricted water. These conditions make navigation difficult, especially when the handling of heavy barge tows is involved and river freight is now practically all transported in barges forming tows to the limit of the towboat's capacity.

It is most essential that a river towboat possess superior maneuvering ability, and be of light draft to meet channel conditions. This requires minimum hull dimensions and maximum power. The power plant should be flexible of control to meet the varying and extreme power demands. Accommodations for personnel should be of a high standard to meet the American conception of comfort. Reliability and continuity of performance are major considerations. While the above make for an overall efficient boat, economy in operation is essential.

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Coaling Facilities

Coaling facilities now in existence on the river are of an unsatisfactory nature and compare poorly with those of seaports. It is difficult for one to conceive that the use of coal as fuel for river craft will, in the reasonably near future, develop to a volume which would warrant the large investment necessary to provide such facilities at suitable intervals along the river. These intervals would, of necessity, be approximately three hundred miles apart, otherwise, the danger of exhausting the fuel supply between stations would be a menace to safe operation.

The time consumed in fueling operations would depend largely on plant facilities, but in no wise could it be reduced below the rate required for stowing coal in the vessel's bunkers. It is most essential that this matter of time required for fueling be viewed with care, as towboats only earn revenue when actually moving tonnage. If time is lost for the purpose of fueling, this must be charged against the fuel. In the past, operators have carried a coal supply in one or two barges alongside the towboats, from which coal was moved to the towboat while enroute as used. While this increased the radius of operation without endangering the vessel, due to exhausting the fuel supply, and permitted the vessel to be operated at much lighter draft and better trim, which is important, it is obvious that it is a rather costly arrangement, as it reduces the revenue —carrying tonnage which can be handled in any individual tow. This manner of handling coal is laborious and creates a great amount of inconvenience.

Pulverized Coal Installations

To date only two attempts have been made to fit river towboats for burning powdered coal, to the writer's knowledge. The first was several years ago, by the Goltra Barge Line on the Steamer *Minnesota*. No publicity was given to this venture, but it is known that after trial, the equipment was removed and hand firing resumed. The second instance is that of the Steamer *Illinois* of the federal barge line, and a sister vessel of the *Minnesota*. The latter experiment has now been in progress for at least a year, and numerous major alterations have been made to the installation, from time to time. Practically no data have been made public pertaining to this venture, but from reliable sources, information has been obtained which indicates that the results could hardly be viewed with optimism, for the revenue resulting from work performed would hardly pay for the coal and fuel oil burned, for oil is used at least part of the time.

In conclusion, it is desirous to state that there are so many contributing factors forming the combination required for the most overall efficient and successful river towboat, all of which must be taken into consideration, that one cannot be governed by the matter of a slight differential, in fuel cost, especially when the differential that might be obtainable is still far from a proven fact or even a reasonable possibility. The differential in favor of powdered coal would have to be very large to reward the boat owner or operator for the increase in capital charges with the resulting overhead and the maintenance of the pulverizing and coal handling equipment, not to mention the increased draft resulting from this additional weight carried.

TO SELL U. S. LINES.—It is reported that the Government-owned United States Lines and the American Merchant Line will be placed on sale soon.

Pulverized Coal Urged for Lake Vessels

GEOGRAPHICAL location favors the use of pulverized coal for fuel on Great Lakes vessels, said Carl J. Jefferson, head of the fuel conservation section of the United States Shipping Board, in an address at the annual meeting of the Lake Carriers' Association held recently in Cleveland, O.

"The majority of your steamers are now coal burners and are apt to remain so ,as here the difference between the cost of oil fuel and coal is decidedly in favor of coal," he said. "When the situation is one where coal is plentiful and cheap while oil is expensive, then the advantage of coal becomes self-evident. Such is the case on the Great Lakes.

"You who are operating coal burners know that year by year it has grown increasingly difficult to obtain the type of personnel who can swing on a slice bar, heave coal, haul ashes and at the same time have the slightest conception whatsoever as to how to convert the maximum number of potenial B. T. U.'s in a lump of coal into mechanical energy via the latent heat and entropy route.

"It is not at all strange that there should be this difficulty in securing satisfactory firemen. The work in a hand-fired stoke hold is one of the hardest labor tasks that I know of and Americans have become accustomed to having the difficult and distasteful labor tasks of life accomplished by machinery. You who operate vessels on the Great Lakes know this only too well. The cargo handling machinery at your docks and on your vessels proves it.

"It is an engineering axiom that when a mechanical substitute is developed, it must not only do the job as well as it was formerly done by manual labor, but better. That is, it must obtain better results from the same raw material, or else at least equal results with an inferior grade of raw material. This axiom has dominated the entire development work that has been carried on up to date in the efforts to produce a satisfactory sea-going installation of pulverized fuel."

Mr. Jefferson described the experimental work that has been done in the application of pulverized coal to the S. S. *Mercer* and declared that the use of pulverized fuel on board ship is no longer a theory but an established success. Our experience on the *Mercer*, he said, has shown that pulverized coal is a good antidote for steaming trouble as the steady heat that can be maintained and the higher rates of combustion per cubic foot of furnace volume possible with this type of fuel permit continuous operation at much greater percentages of boiler ratings than can ever be obtained with hand firing.

Coast Guard Cutter Chelon Launched at Quincy

THE Coast Guard cutter *Chelon*, the first of five cutters now under construction at the Fore River Plant of the Bethlehem Shipbuilding Corporation, Ltd., was launched on May 19. When the Congress authorized the construction of these vessels, the Engineering Bureau of the Coat Guard Service, in working out their design, took into consideration the central station power plants which supply service to industry and the home, and applied this same principle aboard ship.

The power plant on each of the new vessels consists of one main and two auxiliary Westinghouse turbine electric sets. All of the auxiliaries will be driven by power furnished from the main turbine unit. Under this arrangement it is possible to supply power

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for lighting, pumping, radio and all other purposes throughout the vessel direct from the main engine.

When cruising under ordinary conditions, enough additional power will be generated by the main driving unit to supply all auxiliary needs, the auxiliary turbines being used when in port, or while maneuvering the ship at reduced speeds. The picking up of the load by auxiliary sets when the cutter is steaming at reduced speeds will be effected by simple automatic control which operates the steam valve of the auxiliary turbine.

Details of Machinery

The main Westinghouse turbine set, comprising a steam turbine, alternating current generator and a synchronous motor driving a single screw, will develop 3,000 shaft horsepower at a speed of 163.5 revolutions per minute. The alternating current generator, directly coupled to the turbine, will develop 2,600 kilowatts, and the turbine, working at a steam pressure of 250 pounds per square inch with 250 degrees of superheat, will have a speed of 3,600 revolutions per minute. A vacuum of 28½ inches will be maintained.

The peace-time armament to be carried will consist of one 5-inch, two 3-inch anti-aircraft and two 6-pound guns. Two 5-inch guns, in addition to the above, can be installed in case of war. A long wave high power sending and receiving radio and an emergency set and a short wave telephone set will be installed. There will be a radio and a gyro compass and a fathometer for sounding. An average crew of six commission officers, five warrant officers and approximately eighty men will be carried.

The *Chelon* is being built at a cost of $900,000. She is 250 feet long overall and has a displacement of 2,000 tons. She is designed to develop a maximum speed of 16½ knots, and will have a cruising radius of 8,000 miles at an average speed of 10½ knots. This average cruising speed is extremely economical for a vessel of this size and type. The usual economical cruising speed will be only 8½ knots.

The *Chelon* will be placed in service about the middle of August on the Pacific coast replacing the *McCullough*.

Marine Railway at New Orleans

THE New Orleans dock board announces that work of installation has commenced on a quick acting, ball-bearing marine railway on the inner harbor navigation canal, especially designed for hauling out boats and yachts of all character on an even keel. By use of diagonal transfer tracks and parallel switch tracks the railway will be able to handle, in and out of the canal, an unlimited number of boats in a day. This is the first of three parallel units, which are to be built by the Higgins Lumber & Export Company and which will function separately or in combination for hauling out large craft.

The new marine railways are a part of the Higgins shipyard and repair plant which already is established on the canal. In addition, the company already has in constant operation a heavy marine railway, able to lift out 160-foot barges, ferries, etc., and a smaller set of ways used for handling towboats. It also conducts a building plant for the construction of yachts, boats and wooden barges of all types, specializing in speedboats and safety planes for outboard motor installation.

Diesel Electric Towboat for Engineer Corps

By H. P. Bish*

THE dock and river trials of the 110-foot Diesel electric stern wheel towboat *Tecumseh,* constructed by the Charles Ward Engineering Works, Charleston, W. Va., for the United States Engineer Corps, were recently conducted in the Kanawha river at Charleston. This towboat will be used by the United States Engineers in the St. Louis district and was delivered to the district engineer early in May.

The trials proved satisfactory and the boat demonstrated its ability to manoeuver and otherwise to perform in an efficient manner. Runs were made over a measured mile course at several speeds and comprehensive data were obtained at each of these speeds. Captain Drinkwater, C. H. Giroux and Mr. Haas, all of the United States Engineers Office, Washington, conducted the trials.

Machinery

The *Tecumseh,* which has a length of 110 feet, follows, in general, typical river towboat hull design and arrangement. The main propelling machinery consists of a 210-kilowatt Diesel driven generator set operating at 400 revolutions per minute, which delivers current at 190/315 volts to two 115 horsepower 360/600 revolutions per minute shunt-wound motors connected through link belt chains to the stern wheel.

Auxiliary power and lighting, as well as excitation for the main generator and propelling motors, are supplied by a 20-kilowatt, 120-volt, compound wound auxiliary generator set operating at 400 revolutions per minute. Both the main and auxiliary generators are driven by a 300 horsepower Lombard Diesel engine.

All of the auxiliaries are motor driven. The electrical equipment, including the propulsion and auxiliary motors and control, were supplied by the General Electric Company.

Control

The propulsion control is of the variable-voltage type. The main control panel and auxiliary switchboard are located in the engine room. The controlling rheostat for maneuvering and for obtaining reduced speeds of operation is located in the engine room directly back of the main control panel. This rheostat may be operated either from the engine room or from the pilot house. Operation from the pilot house is obtained by mechanical connections between a control pedestal located in the pilot house and the rheostat. A small meter panel indirectly illuminated is located in the pilot house to indicate at all times to the operator the speed of the paddle wheel and the power of the main generator.

The propelling motors are supplied with constant voltage excitation at all times. Variation in speed is obtained by varying the armature voltage. Except during maneuvering this is accomplished by the inherent characteristics of the generator which has a self-excited shunt field, a separately-excited shunt field, and a differentially-connected series field. The characteristics of the main generator are such that the voltage increases as the current decreases and vice versa, so that the product of volts times amperes, which is a measure of the power, is practically constant over the operating range of 360 to 600 revolutions per minute of the propelling motors. During full load operation, the engine

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* Federal and marine department, General Electric Company, Schenectady, N. Y.

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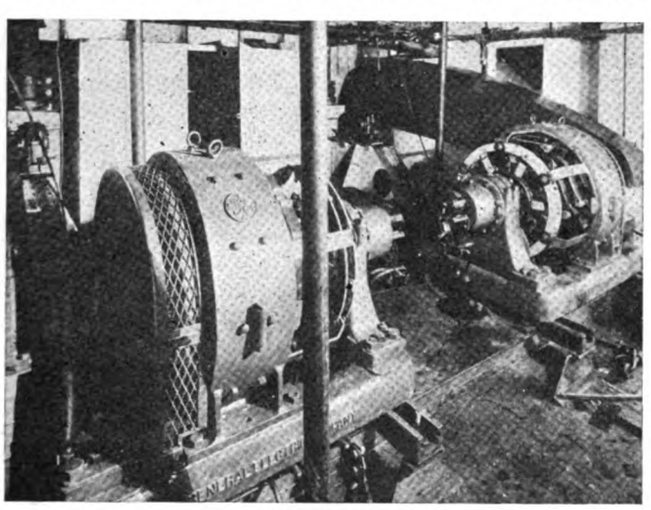
is operated on what might be termed full throttle; i. e., the operating governor does not come into operation until the speed has exceeded a certain amount. This speed is several revolutions above the normal full load operating speed of the engine. Under normal running conditions, the generator requires just full load from the engine at all times. As the load is thrown on and off during maneuvering, the engine governor comes into

The Tecumseh

operation, holding the light load speed at the predetermined value mentioned above. The engine ran very well during the trials, the operation of the governor under light load being particularly good. There was little or no tendency of the engine to race when the load was thrown off suddenly, as the governor responded quickly to any change in load.

Advantages of Control System

This method used for controlling the speed of the boat is considered a decided step forward in the field of Diesel electric drive. The electrical propelling machinery is



Stern wheel propelling motors

so designed that the motors will always run (except during maneuvering) at such a speed as to take exactly full load power from the Diesel engine which drives the propelling generator. This result is accomplished whether the vessel is running light or is pushing a tow and while operating in either shallow or deep water. In this manner, maximum overall speed and highest efficiency is always automatically obtained from the machinery without undue attention from either the pilot house or engine room.

It is a well known fact among towboat operators that the required power changes considerably with different lengths and sizes of tow and, in order to obtain or use the full power for which the engine is designed, the paddle wheel should be speeded up or slowed down, depending upon the size and length of tow. This condition is readily obtainable with the common type of Diesel electric drive by varying the strength of field of the propelling motors. For instance, when it is desired to run the vessel light, the motor field may be weakened and the motors will then run at a maximum speed which would be so chosen as to require full power of the engine. When pushing a tow, the strength of the motor fields may be increased, thus slowing down the motors to accommodate the power produced by the engine. Thus, full advantage is taken of the horsepower of the engine under light and loaded operation of the boat as the engine runs continuously at its maximum designed revolutions per minute. On vessels prior to the *Tecumseh,* this was accomplished by adjusting a motor field rheostat located either in the engine room or in the pilot house. In some instances, the rheostat was made motor-operated and installed in the engine room, but with control of the small motor, driving the rheostat mechanism, in the pilot house.

It is also a fact, although probably not so well known, that the power requirements of river craft vary considerably with changes in depth of water in the river in which the boat is operated. For example, in shallow water the power requirements are considerably greater than they are in fairly deep water, so that as the vessel progresses along a river with varying depths, the power increases and decreases according to the depth of the water. Hence, in order to utilize full power of the propelling engine, it is again desirable to increase or decrease the paddle wheel speed as the loading changes. This feature is also readily taken care of on the usual Diesel electric drives by the same means and in the same manner as the speed is varied for changes in length and size of tow. To obtain these results requires frequent attention from the pilot house operator; otherwise, either the engine is overloaded or the boat is running at a speed below that of which it is capable.

On the *Tecumseh,* change in speed under normal running conditions is made entirely automatic, as previously described. The pilot house operator sets his control handle at either the "full ahead" or "full astern" position and the motors operate at such a speed as to load up the engines to their full horsepower capacity only. Of course, provision is made so that the operator can select lower speeds if he so desires.

Brazing A Cracked Cylinder Wall

By R. R. Vorhees

AN inexpensive and rapid method of repairing a cracked marine engine cylinder wall without removing the engine from the boat and stripping it has been developed by Clifton Rogers, one of the partners in the Rogers Bros. Machine Shop at Moss Point, Miss.

The method as developed is to operate the engine without water until it heats to about the same degree as if it had been superheated for brazing. When it reaches this condition, the crack in the cylinder wall can be brazed without difficulty, and without fear of the cylinder cracking, which would be the case if it were brazed cold. This method has been used many times, in each case with success, the brazing being exactly as good as if the engine had been removed from the boat and dismantled.

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Questions and Answers for Engineers

Practical information on the operation and maintenance of boilers, engines and auxiliaries

This department is maintained to help those who desire practical information regarding engine room problems or who are preparing to take examinations for a marine engineer's license. Readers are urged to send in questions. Inquiries bearing the name and address of the writer will be answered promptly by mail. If the question is of general interest the answer will also be published in an early issue of the magazine, although the identity of the writer will not be disclosed in doing so. Anonymous communications will not be considered.

Clearance Above Air Pump Bucket

Q.—What should be the clearance above the bucket for an Edwards type air pump about 30 inches diameter driven by a beam from the low pressure engine?

A.—A clearance of ½ inch above the bucket in its top position for an Edwards air pump of the specified size is good practice.

Steam Jacketed Cylinders

Q.—Describe a steam jacketed cylinder and what is the object of same?

A.—When the cylinder of an engine is surrounded with a casing and the space between the casing and cylinder is filled with live steam while running, the cylinder is said to be steam jacketed. The object is to prevent condensation from taking place in the cylinder.

Size of Engine

Q.—How is the size of an engine generally expressed?

A.—The size of an engine is generally expressed by giving the bore or diameter of the cylinder and the stroke in inches.

Guide Bars

Q.—Why are guide bars used on an engine?

A.—They constrain the crosshead to move exactly in line with the axis of the cylinder, thereby relieving the piston rod of all bending stresses.

How to Start a Constant Speed Motor

Q.—How would you start a constant speed motor, whether shunt or compound?

A.—See that all bearings are well supplied with oil and that oil rings are free to turn. Inspect all connections for loose screws and wires. Make sure that the lever arm of the starting box or controller arm of the starting box or controller is in the "off" position. Close the main switch or circuit breaker, also the field switch. Move the lever arm of the starting box or controller to the running position, pausing long enough on each notch to allow the motor to come up to the speed of that notch. If using a controller, throw the short-circuiting switch and move the controller handle back to the starting position. If using a starting box, the lever arm should remain in the running position.

Object of the Eccentric

Q.—What is the object of the eccentric?

A.—It imparts motion to the valve.

Direct vs. Indirect Slide Valve

Q.—Explain the difference between a direct and an indirect slide valve.

A.—It is said to be direct when it opens the left port upon moving to the right and closes it by moving to the left. A slide valve is said to be indirect when it opens the left steam port by moving to the left and closes it when moving to the right.

Double Ported Slide Valve

Q.—Explain the difference between the ordinary D slide valve and a double ported valve?

A.—With the same travel, the double ported valve gives double the opening to steam that the common valve does; otherwise they are alike in all respects.

Weight of Water

Q.—Give the weight of a cubic foot of water?

A.—A cubic foot of water at its maximum density (39.2 degrees F.) weighs 62.425 pounds; at 32 degrees F. the weight is 62.4 pounds per cubic foot and at the boiling point, which is 212 degrees F., a cubic foot of water will weigh 59.7 pounds.

Three-Cylinder Compound Engine

Q.—What is a three-cylinder, three-crank compound engine?

A.—It is an engine built with three cylinders and three cranks, with one high pressure cylinder and two low pressure cylinders. In this type of engine one-half of the exhaust from the high pressure cylinder passes to each low pressure cylinder.

How to Shut Down a Constant Speed Motor

Q.—How would you shut down a constant speed motor?

A.—Open the main switch or circuit breaker. After the motor has come to rest, see that the lever arm of the starting box has returned to its original position. Open the field switches, then have the machine thoroughly cleaned and put in order for the next run.

Preventing Galvanic Action in Condensers

Q.—As a general rule what precautions are taken against the deteriorating effects of galvanic action in a surface condenser? What causes this action?

A.—Condenser tubes are tinned both outside and inside to prevent the acidulated water from coming into contact with the copper in the tubes and zinc plates are suspended in the channel way of the air pump and in the hot well. The galvanic current attacks the zinc more readily than iron or steel and therefore most of its destructive energy is used up in destroying the zinc. A part of the impurities found in water is sulphuric acid and this acid, in connection with the copper in con-

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denser tubes, the iron of the condenser casing, feed pipes, boilers, etc. constitutes a galvanic battery, which in turn sets up a galvanic current, causing rapid corrosion.

Duplex Pump

Q.—Describe a duplex pump.

A.—A duplex pump has two steam cylinders and two water cylinders, each one having the necessary valves and pistons. The steam valves of one side are operated by the other side, and vice versa. One suction main serves both water cylinders and both water cylinders discharge into the same main discharge line.

Speed of Pump

Q.—How would you ascertain the velocity of flow or piston speed of a pump?

A.—Multiply the number of strokes per minute by the length of stroke in feet or fractions thereof. This will be the piston speed in feet per minute.

Back Pressure of Turbine Exhaust

Q.—What advantage has a turbine over a reciprocating engine in the disposal of its exhaust steam?

A.—The steam turbine expands its working steam to within one inch of the vacuum existing in the condenser; that is, if there is a vacuum of 28 inches in the condenser, there will be 27 inches of vacuum in the exhaust end of the turbine. There is usually a difference of 4 or 5 inches between the mean back pressure in the cylinder of a reciprocating condensing engine and the back pressure in the condenser.

Economy of Steam Turbine

Q.—What are the two principal sources of economy the steam turbine possesses in a high degree?

A.—The two main sources of economy that the turbine possesses in a much higher degree than the reciprocating engine are its adaptability for using superheated steam and the possibility of maintaining a higher degree of vacuum.

Speed vs. Power of Engine

Q.—If the revolutions per minute are doubled, will an engine develop twice the power?

A.—If the revolutions per minute of an engine are doubled the back pressure on the piston will be greater and the frictional resistances increased, therefore double the power would not be developed.

Firetube vs. Watertube Boilers

Q.—What is the difference between a firetube and a watertube boiler?

A.—In a firetube boiler the water surrounds the tubes, the flame and hot gases being inside the tubes, while in the watertube boiler the water is inside the tubes which are surrounded by the flame and hot gases.

Indicator Springs

Q.—What is meant by the scale of the indicator spring and about what scale is usually selected and used for a given boiler pressure?

A.—The height to which the indicator piston will rise under a given steam pressure depends on the stiffness of the spring. Indicators are usually furnished with a number of springs of different or varying degrees of stiffness. They are distinguished by the numbers 10, 20, 30, 40, 50, etc. These different numbers indicate the pressure per square inch required to raise the pencil of the indicator one inch and are called the scale of the spring. The scale selected should be about one-half the boiler pressure. For instance, with a steam pressure of 75 pounds per square inch a spring marked 40 should be used.

How to Change Lead of Valve

Q.—If a slide valve had a ¼-inch lead on top and ⅛-inch on the bottom, how would you change it to have a ¼-inch lead on the bottom and ⅛-inch on top?

A.—Put a ⅛-inch liner under the foot of the eccentric rod or, if the valve gear travels too close to the valve guide, take the valve out and put a ⅛-inch washer on the shoulder of the valve spindle where the valve rests.

Laying Up Marine Machinery

Q.—What is meant by the term "laying up marine machinery" and what is the principal danger to be guarded against at this time?

A.—Laying up a ship means putting all machinery and boilers in such condition that the vessel may remain unused for an indefinite period of time without impairing its further usefulness. The principal danger consists in rusting and corroding.

Laying Up a Boiler

Q.—How is the interior of a boiler prepared for laying up?

A.—After being cleaned, it is thoroughly dried and must be kept dry, as moisture and dampness promote rusting and corrosion. To keep a boiler dry inside some engineers make use of the natural circulation through the upper and lower manholes, while others place flat pans, filled with quicklime for the absorption of moisture, into the boiler and then close it up tight.

Will Boilers Explode When Ship Sinks

Q.—Will the boilers explode when a steamship sinks?

A.—It is perhaps not practicable to answer this question definitely. It is believed that boilers generally do not explode on the occasion of a vessel sinking, although a number of such explosions have occurred.

It is believed that the metal of the boiler is always hotter than the contained water, because were this not the case the generation of steam would not take place. Accordingly, a boiler explosion would probably be the result of the weakening of the plate by reason of the introduction of cold water to a point where it was no longer able to withstand the boiler pressure.

Unburned Carbon in Oil-Fired Furnace

Q.—We have two Babcock and Wilcox boilers, Todd oil burning system, two burners to each boiler. We are having trouble with the carbon from the outside burner in the port boiler. When we push the carbon from in front of this burner to the back of the furnace, it lies there and will not burn up, it resembles clinkers from soft coal. When we push the carbon from the other 3 burners, it burns up. Will you kindly tell me where the trouble is and why the carbon from this burner does not burn up?

A.—The cause of failure to burn carbon deposit from the outside burner of your port boiler is probably due to lack of oxygen supply or, in other words, sufficient air does not reach that particular part of the combustion chamber. It is possible that there may be an obstruction at some point outside of the boiler preventing a free flow of air to the burner, or that the blower is located at a distance farthest away from that burner or that the burner itself may be tipped at such an angle that the flame does not properly reach the carbon. The temporary installation of an air pipe leading to the vicinity of the deposit would be a check on the lack of oxygen theory.

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Questions and Answers Relating to Ship Design and Construction

By J. L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquires should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Removing Mill Scale from Structural Steel

Q.—In removing mill scale from structural steel by the "pickling" process, what acids are used and in what proportion to water; also, which is the most advantageously employed from an economic standpoint? By what other methods is this scale successfully removed?

A.—Either hydrochloric or sulphuric acid is used in preparing the pickling bath. The acid content of the bath solution depends, largely, on the judgment and experience of the picklers. In the interest of economy, the strength of the solution need be no greater than sufficient to completely remove the scale in a reasonable time or else so soften the scale that it may readily be removed by brushing and washing.

The General Specifications for Building Ships of the United States Navy, edition of 1917, specifies a strength solution of one part commercial hydrochloric acid to nineteen parts of water. This requirement has been largely superseded by the use of sulphuric acid in proportions varying from one part acid to twenty parts water by weight to one part acid to forty parts water by volume. This latter strength is claimed to be equal to the standard hydrochloric acid solution.

The substitution of sulphuric for hydrochloric acid has probably reduced the cost of removing this scale by about one-third.

Acid sodium sulphate containing free sulphuric acid, commercially known as nitre cake, has supplanted both hydrochloric and the commercial sulphuric acid in some building plants. Nitre cake, being a by-product of nitric acid, manufacture is cheaper than acid and is reported to give very satisfactory results. Its use is attended with some disadvantages, however, since its use requires about twice the time as compared with sulphuric acid. It is also found advisable to use the nitre cake with some sulphuric acid for when substituted for the entire amount, due to the rapid accumulation of salts, requires frequent changing of the bath.

The removal of mill scale by sand-blasting has been employed in some instances, but not generally adopted.

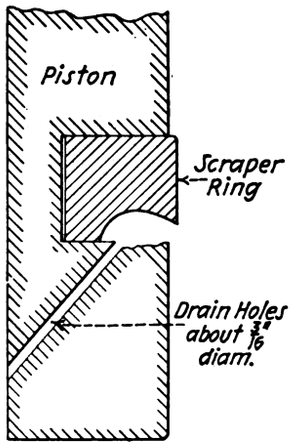
The substitution of chilled cast iron shot for sand has been resorted to with the result that while the scale was well removed, minute surface indentations were produced by the impact of the shot.

A common practice is to allow the material to stand a sufficient time after rolling, whereby the natural process of rusting, which may be greatly expedited by periodic applications of water, may cause the scale to drop off, or else become so loosened that it may be readily removed by hammer blows or by wire brushing.

Lubricating Oil Losses

Q.—I am the engineer and owner of a 165 horsepower Enterprise Diesel engine, 4 cycle, 4 cylinder, turning 300 revolutions per minute. We run on 4,000 pounds pressure and 10 pounds pressure on lubricating oil. I am using 14 gallons of oil every 24 hours; 4 gallons in the oiler and 9 gallons in the day tank and 1 gallon for oiling outside parts. The day tank loses ½ gallon every hour. There is no leak outside of the engine in the pipe lines. We have tried to take the edge off the piston rings but this does not help. We have tried to cut down the pressure on the oil also. What becomes of the oil?

A.—If there are no leaks in the lubricating system outside the engine, there is but one place the lost lubricating oil can go—it is being burned in the cylinders. Loss of oil in this way is a characteristic feature of this type of engine but the loss in this case is excessive. No information is given as to the arrangement of the lubricating system but I assume that in includes a low pressure pump for the bearing oil and separate pumps for the cylinders.



Section through piston skirt

To correct, or ameliorate, the trouble I would suggest cutting out the cylinder lubricating pumps altogether. After making a short run with these pumps cut out, open up one cylinder to see if it is getting plenty of oil. If it is, then cut down on the pressure in the bearing lubricating system. If the cylinders are worn and the piston rings leak, the loss of lubricating oil into the cylinders cannot be prevented but if these parts are in good condition and the procedure suggested does not reduce the oil loss there is only one thing more to do — that is, turn a groove in the skirt of each piston, near the bottom, and put a scraper ring in the groove, the ring to be shaped as shown in the sketch. A series of 3/16-inch holes should be drilled through the piston skirt as shown, to drain the oil out of the grooves as it is scraped off the cylinder walls.

Cause of Jumping of Polarities of Dynamo

Q.—What are the causes of jumping of polarities of a dynamo?

A.—The opening of the field switch of a self-excited shunt-wound dynamo without sufficient discharge resistance may cause a reversal or jumping of polarity. A short circuit in the line, or a heavy load sufficient to

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trip the circuit breaker, may cause a "kick back" on the machine, resulting in a demagnetized condition, so that when attempting to again build up the voltage the direction of flow may be in the wrong direction or the machine fail to start. To correct the polarity, field excitation from an outside source in the proper direction will be required to bring the machine back to normal.

Glucinum

Q.—Can you give me any information relative to the metal "glucinum"? I understand that it is very light and that it has a high melting point.

A.—Glucinum, formerly most generally known as Beryllium, was discovered by the French chemist Vauquelin in the year 1797 or 1798. After many unsuccessful efforts by other chemists, Wohler succeeded, in 1827, in producing metallic glucinum in a pure or nearly pure state.

Relative to the properties of glucinum, authorities are at wide variance; this disagreement being due, perhaps, to the difficulty of obtaining the element in a pure form. Small amounts of different impurities might reasonably be expected to influence its properties as they do the more common metals.

Metallic glucinum is silvery white or steel gray in color and has a hardness of 6 to 7 on Moh's scale. It is malleable, easily forged and cold rolled, and takes a high polish; but of its tensile strength and rigidity, little is known. Its electrical conductivity is higher than that of copper, approaching silver in this respect. Later and apparently reliable determinations fix its specific gravity at 1.64, although some authorities give somewhat higher values. The atomic weight is 9.1 and the melting point 1280 degrees Centigrade, 2336 degrees Fahrenheit.

The metal oxidizes slowly and superficially in moist air; when heated to redness in oxygen it oxidizes on the surface, the oxide thus formed acting as a protective coating. It reacts with both dilute and concentrated hydrochloric and sulphuric acids, although nitric acid has slight effect on it even at high temperatures. It is not attacked by ammonia but is readily soluble in potassium hydroxide.

Glucinum alloys with aluminum in all proportions. An alloy of 90 percent aluminum and 10 percent glucinum has a specific gravity of 2.5. An alloy of 85 percent aluminum, 10 percent glucinum, and 5 percent copper has a specific gravity of 2.8 with a tensile strength and toughness said to equal that of bronze. An alloy having a specific gravity of 1.5 may be formed by the use of 25 percent of lithium with 75 percent of glucinum. It is claimed that this alloy, after oxidizing superficially, is as resistant to corrosion as is iron.

The alloys of glucinum and copper have received considerable attention. On account of their electrical properties they are of value in the manufacture of scientific instruments. They also possess a resonance of excellent quality, which property makes them useful for parts of musical instruments.

The foregoing information, which has been taken, largely, from Chemistry of the Rarer Elements by B. Smith Hopkins, Professor of Inorganic Chemistry, University of Illinois, deals with the general properties of glucinum, more particularly the physical. The chemical properties have not been stressed, since they are of less interest to the engineer.

The uses to which this element may be put in the future will depend on the ability of manufacturers to reduce its present prohibitive costs. Corson in the *Brass World*, 1926, Vol. XXII, page 314, states that the price of beryllium in the United States is about $200 a pound, but probably not more than one-fourth that amount in Europe. The *Iron Age*, of January 21, 1926, page 220, says that beryllium probably can be produced on a commercial scale for $20 a pound.

Since glucinum has been estimated to comprise between 0.01 and 0.001 percent of the earth's crust, there is no reason for the belief that, when commercial uses have developed and the cost of production has been reduced to a reasonable point, enough of the element will be found to supply any demand.

New Books

SEAWAYS AND SEA TRADES. By A. C. Hardy. Size, 6 by 9¾ inches. Pages, 240. Illustrations, 54. New York, 1928: D. Van Nostrand Company. Price, $6.00.

In this volume, the author has attempted to interpret trade routes and the cargoes carried on them in terms of maps and show thereby something of the meaning of the vast business of carrying people and goods by water. The work is of principal value to the layman or student who desires to learn something about the business of shipping.

MARINE ENGINEERING IN THEORY AND PRACTICE. Volumes I and II. By S. G. Wheeler. Size, 6½ by 10 inches. Pages. 597. Illustrations, 463. London, 1928: Crosby Lockwood and Son.

The first volume of this work contains more elementary theory than the second and it deals with both the reciprocating engine and the turbine from the practical as well as the theoretical point of view.

The second volume, while mainly concerned with practice, is not confined to practical details to the utter exclusion of theory, and even in its most technical and applied sections, involving particulars of construction, design and arrangement of different types of machinery, a presentation of general tendency in principle and requirement has been aimed at, rather than any indiscriminate cataloging or irrelevant descriptions of different designs.

DESCRIPTIVE LIST OF SOME EMPIRE TIMBERS. Size, 9½ by 6 inches. Pages, 77. One illustration and one table. London, 1928: The Imperial Institute. Price, 2 shillings.

In this work the Imperial Institute Advisory Committee on Timbers has drawn attention to the practical qualities of a number of timbers produced in certain countries of the British Empire which it is considered should be more widely known among the timber trade and timber using industries. The timbers selected vary widely in character and uses, and among them will be found woods of interest to architects, builders, furniture and cabinet makers, joinery manufacturers and shipbuilders while other woods are suitable for sleepers, plywood manufacture and veneers. In each case the names of the timber, and the country of origin, are given, together with a statement of the general charac- and present or suggested uses of the timber. Particulars of the sizes in which the timber is usually available and probable average prices at the time of preparing the list are also given.

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DIESEL AND OIL ENGINEERING HANDBOOK. By Julius Rosbloom. Size, 5 by 7 inches. Pages, 611. Profusely illustrated. Brooklyn, N. Y., 1928: The Industrial Institute, Inc. Price, $5.

This is the fourth revised edition of a handbook containing a compilation of a quantity of data relative to Diesel and oil engines, together with some elementary explanations of the principles of thermodynamics, indicator practice and electrical measurements. Questions and answers relative to the operation of internal combustion engines, together with the vast amount of data that the book contains, should be of value to anyone desiring ready Diesel engine information.

INSTRUCTIONS AS TO THE SURVEY OF PASSENGER STEAMSHIPS. Two volumes. Issued by the Board of Trade. Volume I, Size, 5½ by 8½ inches; Volume II, Size, 8½ by 13 inches. Pages, 325. Numerous tables and charts. London, 1928: His Majesty's Stationery Office. Price, 55 cents.

These instructions, issued by the Board of Trade under the authority of the Merchant Shipping Acts for the guidance of their surveyors in the survey of passenger steamers, are mainly a consolidation of the instructions which have already been issued as separate publications. These relate to the construction and survey of passenger steamships and accommodations, marine boilers, engine shafts, oil fuel installations, fire extinguishing appliances and other equipment.

Volume I comprises general instructions to surveyors and specific instructions dealing with the survey of hull and passenger accommodations, bilge pumping arrangements, boilers and machinery, and a general description of flooding curves and tables.

Volume II contains standard diagrams of floodable lengths, standard forms and sectional area coefficients.

Communication

Turbine Clearances

WASHINGTON, D. C.

TO THE EDITOR:

The writer has been very much interested in the section of MARINE ENGINEERING AND SHIPPING AGE devoted to "Questions and Answers for Engineers". He realizes the difficulties of the editor of that section and appreciates the fact that brief answers are desirable. Some questions, however, can not be treated adequately in such a manner. The writer takes the liberty of elaborating on some "answers to questions" he has been particularly interested in, and of expressing his opinion on other answers with which he does not wholly agree.

In the December 1927 issue, the question was asked: "In a Parsons steam turbine how much clearance is allowed between the moving and the stationary parts?" The answer was: "The tips of the revolving blades just clear the walls of the cylinder and the tips of the stationary blades just clear the surface of the rotor."

To the writer this answer seems inadequate, and is true only for the older type of Parsons turbine where the leakage past the end of a row of blades is restrained as far as possible, as indicated in the answer. The actual clearances when the turbine is cold vary from about 30/1000 inch for the short high pressure blades to about 50/1000 inch for intermediate blades and up to 100/1000 inch for the long low pressure blades, for older type turbines. When the turbine is heated up the blade tip clearance decreases, owing to the unequal expansion of the casing, rotor and blades, the latter expanding much more than the casing and rotor, and therefore reducing the tip clearance. At the end of the turbine, where the blades are short, the clearance may decrease by only a few thousandths, but at the end of the turbine, where the blades are long, the clearance may fall off to almost one-half.

In the most recent Parsons turbines the blade tip clearance has almost been done away with altogether, the edges of the blades being made very thin so that they will wear down instead of stripping on contact. In another of the latest types of Parsons turbines, as exemplified in the high pressure turbine steamer *King George V*, the tips of the revolving blades are an appreciable distance from the walls of the cylinder and the tips of the stationary blades are likewise an appreciable distance from the surface of the rotor. This distance may amount to ¼ or ½ inch. The steam is restrained from leaking past the end of a row of blades by the extremely small axial clearance between the shrouding ring surrounding the tips of the blades and the body of the corresponding row of stationary revolving blades. These are known as end tightened blades.

This brings up the question of axial clearances in a Parsons turbine, which aspect was not touched upon in the original "answer". To the operating engineer the axial clearances are the ones he is most interested in. The radial clearances can only be taken care of by proper warming up and cooling off of the turbine, and by constant attention to the oil service so as to prevent temporary stoppage of the oil which would result in a rapid heating up of the main bearings and a consequent melting of the white metal, which would permit the wear down of the rotor and probable stripping of the blades. The bearing might also be heated up by an excessive steam leakage from the glands.

The axial clearances between the rows of revolving and stationary blades vary from about 3/16 inch for the short high pressure blades to about ½ inch for intermediate blades and up to ¾ inch for very long low pressure blades.

The axial or side clearance forward is generally slightly more than the side clearance aft. This clearance throughout any expansion is seldom constant, due to difficulties of construction. In the *King George V* type of Parsons turbine the axial clearances are an extremely small amount, as noted.

These side clearances between the revolving and the stationary blades are sufficient to prevent contact provided the dummy clearance is properly taken care of. In an astern turbine the dummy is usually of the radial type with clearance of about 10/1000 inch to 20/1000 inch, but in the ahead turbines facial dummies are generally fitted with axial clearances varying from 7/1000 to 15/1000 in electrical work and rather more in marine work; generally about 15/1000 to 20/1000 for high pressure turbines and 20/1000 to 30/1000 or more for low pressure turbines. It is the duty of the engineer to keep these clearances the correct amount by proper setting of the turbine thrust block. This dummy clearance measurement is the most important and delicate adjustment in the whole turbine and should be attended to every two or three days or even more often. If the thrust block is adjusted for say 30/1000 inch dummy clearance when the turbine is cold, this may be

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reduced to about 20/1000 inch when heated up to working conditions. In some turbines the clearance when heated up may, however, be greater than when cold. The thrust block clearance for oil is usually 6/1000 inch but may reach 15/1000 inch.

Besides blade, dummy and thrust block clearances, we have in a Parsons turbine steam glands which may consist of ramsbottom or split rings or a combination of the above with brass fin blades having radial clearances of 10/1000 to 20/1000 inch. There are also oil baffles at the thrust block to prevent ingress of oil to the rotor casing and blades. These are usually thin brass plates with knife edges fitted not over 4/1000 inch clear of the shaft. Then of course there are the usual main bearing clearances.

ENGINEER.

Personal

H. W. Kent has resigned as president of the **Todd Drydocks, Inc.,** Seattle, Wash., and will devote his time to private interests. He will continue as a director of the Todd Company.

E. A. Sperry, chairman of the board of directors, **Sperry Gyroscope Company,** Brooklyn, N. Y., has been nominated for the office of president of the **American Society of Mechanical Engineers** for next year.

E. W. Stringfield, manager of the **Philadelphia Tidewater Terminal,** has been elected a member of the board of the **Philadelphia Maritime Exchange,** succeeding **Emory R. Johnson,** dean of the **Wharton School** of the **University of Pennsylvania,** who resigned.

John Dowd was recently elected president of the **Maritime Association of the Port of New York** for the fifth time. Other officers elected were: **Emmet J. McCormack,** vice-president, and **Frederick B. Dalzell,** treasurer. **Captain J. C. Reichert** was re-elected secretary.

George W. Atterbury has retired from the **American Ship Building Company,** Cleveland, O., with which he was associated for 30 years. Mr. Atterbury had taken 150 lake boats on their trial cruises during his residence on the Great Lakes. The employees of the company presented him with a handsome ship clock and barometer prior to his departure for Long Beach, Cal., where he will make his home.

Nils R. Herdelin, who has been connected for some years past with the estimating department of the **Bethlehem Shipbuilding Corporation, Ltd.,** has resigned his position with that concern and has become associated with the **Kensington Shipyard & Dry Dock Company,** Philadelphia, Pa., in the capacity of assistant superintendent. Mr. Herdelin's new duties will consist mainly of estimating and supervising new and repair work for the latter company.

Commander J. S. Evans, U. S. N., formerly in charge of the Philadelphia test plant of the **United States Shipping Board,** has been ordered to sea duty on the Pacific coast. The vacancy left by Commander Evans will be filled by **Commander Brosheck.**

Captain Eugene E. O'Donnell was elected president of the **Eastern Steamship Company** at a recent meeting of the board of directors in Boston. He succeeds **Calvin Austin** who has become chairman of the board of directors. Captain O'Donnell, who was born in Boston and comes from a long line of seafaring men, was formerly a captain in the Eastern Steamship Company service. He is also vice-president of C. H. Sprague & Sons, Inc., Boston, Mass., who operate steamships in the coal trade between New England ports and terminals in Hampton Roads, Va.

Capt. Eugene E. O'Donnell

J. S. W. Holton was recently re-elected president of the **Philadelphia Maritime Exchange** for the 26th term. Other officers re-elected were: **Walter T. Roach,** vice-president; **W. Frazier, Jr.,** treasurer; **James T. Kernan,** secretary, and **John F. Lewis,** solicitor.

Rear Admiral Hutchinson I. Cone, U. S. N. (Retired), has been appointed a member of the **United States Shipping Board** as a successor of Rear Admiral William S. Benson, whose term expires June 8. Admiral Cone's appointment was confirmed by the Senate on May 19. He was born in Brooklyn, N. Y. April 26, 1871, graduated from the Florida Agricultural College in 1889 and from the United States Naval Academy at Annapolis in 1894. Admiral Cone comes to the board remarkably well equipped. He is a former engineer-in-chief of the United States Navy. Previous service as vice-president and general manager of the Emergency Fleet Corporation has brought him in close contact with the problems of the Government merchant marine service.

Rear Admiral H. I. Cone

Rudolph S. Hecht, president of the **Board of Commissioners of the Port of New Orleans** for the past 7 years, has tendered his resignation to the Governor of Louisiana, effective immediately. His successor has not as yet been named.

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Joseph A. Ehnes has been appointed commissioner for the **Lake Carriers' Association** in charge of the Buffalo offices, succeeding **Albert H. Lambrix,** who died recently. The new commissioner is a native of Buffalo and entered the service of the association in 1915.

Jesse O. Arkebauer, for the past 8½ years superintendening engineer for **Phelps Brothers & Company** (Cosulich Line), has terminated his connection with that company and has opened an office as a consulting engineer at 11 Moore Street, New York. He was born in Nokomis, Ill., and has had experience in the engineering force of the Plant Steamship Line and the New York & Cuba Mail Steamship Company. Subsequently he entered the New York city ferry service and passed into the United States Steamboat Inspection Service where he served for approximately 10 years. During the World War, he entered the United States Navy as a machinery inspector where he served until 1919 when he entered the service of Phelps Brothers & Company.

J. O. Arkebauer

Professor Herbert Lee Seward of the Sheffield Scientific School of Yale University, New Haven, Conn., has been promoted to be professor of mechanical engineering. Professor Seward received the Ph. B. degree from Yale in 1906, and the M. B. degree in 1908. During the World War he developed and operated the United States Navy Steam Engineering School at Stevens Institute of Technology, Hoboken, N. J., holding the rank of lieutenant-commander. He is commanding officer of the U. S. S. *Eagle 27,* the training vessel for the Connecticut battalion of the U. S. Naval Reserve. Professor Seward is also a member of the Fuel Conservation Committeeof the United States Shipping Board and is chairman of the Board of Governors of the Propeller Club of the United States.

Prof. H. L. Seward

John Wright, marine superintendent of the **Pan-American Petroleum & Transport Corporation,** retired on May 1, after 10 years with that company. Mr. Wright was previously associated with the Clyde Steamship Company and the United States Steamboat Inspection Service.

H. B. Walker, president of the **American Steamship Owners' Association, Ira Campbell** and others are to represent the association at the international shipping conference opening June 18 in London. **C. D. Mallory,** president of the **Atlantic Transport Line,** New York, has been appointed a member of the association.

Samuel S. Sandberg, of Los Angeles, Calif., has been appointed to succeed **Phillip S. Teller,** of San Francisco, as a member of the **United States Shipping Board.** Mr. Teller's term expires June 8.

Heber M. Wells, formerly assistant treasurer of the **Merchant Fleet Corporation,** was appointed disbursing officer of the Shipping Board and treasurer of the Merchant Fleet Corporation on May 22, to succeed E. H. Schmidt, whose death occurred suddenly the previous week. Mr. Wells, who was Governor of Utah for nine years, has been assistant to Mr. Schmidt since October 1921. His home is in Salt Lake City.

Obituary

Harry J. Cornish, former chief surveyor of **Lloyd's Register of Shipping,** died recently at his home in Hempstead, London, England. Mr. Cornish was 88 years of age.

Edward H. Schmidt of Indianapolis, treasurer and disbursing officer of the **United States Shipping Board,** died suddenly in Washington on May 15 of heart disease.

William T. Bonner, well known in marine circles for many years as an expert on marine welding, died recently in the **Cumberland Hospital,** Brooklyn, N. Y. Mr. Bonner was a member of the **American Welding Society** and of the **Society of Naval Architects and Marine Engineers.**

W. Parker Runyon, president of the **Perth Amboy Drydock Company,** Perth Amboy, N. J., died on May 14 in Philadelphia. Mr. Runyon was a member of the **United States Chamber of Commerce,** the **Maritime Association of the Port of New York,** the **Society of Naval Architects and Marine Engineers** and the **Manufacturers' Association.**

Thomas B. Healey, business manager of the **Marine Engineers Beneficial Association No. 33,** died May 14 at his home in Grantwood, N. J. Mr Healey was born in 1874 at Hudson, N. Y., and was licensed as chief engineer in 1895. He has been employed on the Savannah Line, the Barrett Line, Inc., and other companies operating from the Port of New York. Shortly before he entered the employ of the Marine Engineers Beneficial Association No. 33, as assistant business manager, he was chief engineer of steamships of the Union Sulphur Company and the Standard Oil Company. He was commissioned as captain of engineers during the World War and served with the Hon. Herbert Hoover when he was administrator of American Relief in Europe after the war.

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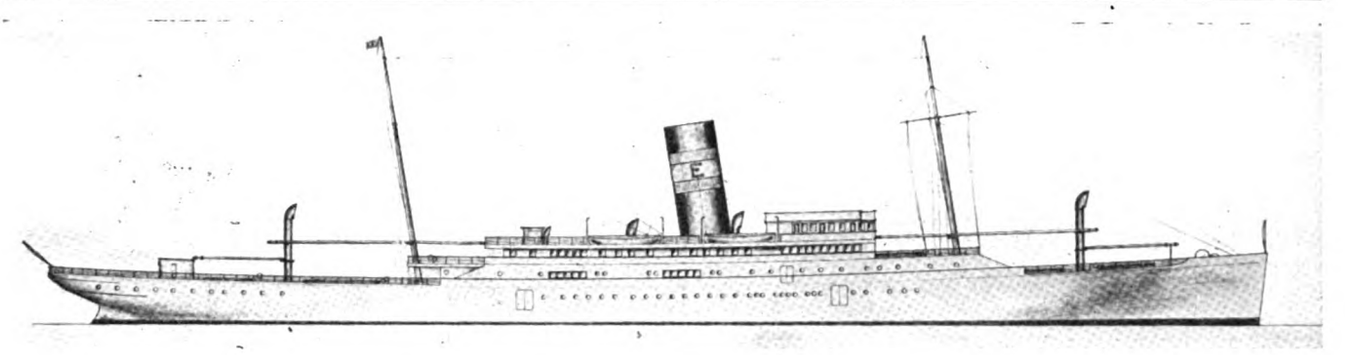
Ship Construction and Repair News

Proposed work—Bids asked—Bids received—Contracts awarded—Current activities



Combination passenger and cargo steamer of 9,500 tons deadweight and 14 knots speed to be built for the Export Line

Export Line to Build Four 9,500-Ton Steamships

IMMEDIATELY following the enactment of the Jones-White bill, the Export Steamship Corporation, 25 Broadway, New York, applied to the Shipping Board for a loan for the building of four 9,500-ton combination passenger and cargo steamships, each with accommodations for 100 passengers and a speed of 14 knots, for operation between North Atlantic ports of the United States and ports in the Mediterranean. The corporation also announced its intention of building four additional vessels every two years for the next six years. Plans and specifications for these vessels will be sent to the shipyards for bids early this month., provided the Shipping Board acts favorably on the corporation's application for a loan for their construction.

The new vessels, which were designed by George Sharp, naval architect, 30 Church street, New York, are of the single-screw, shelter-deck type, 450 feet long between perpendiculars, 59 feet molded beam and 46 feet 6 inches molded depth to the shelter deck. They will have a deadweight tonnage of 9,500 on a draft of 27 feet 10½ inches. The holds will have space for 4,500 tons of cargo and there will be space for 500 tons of refrigerated cargo. The accommodations for 100 passengers will include ample public rooms and deck space.

Steam will be supplied at 325 pounds per square inch working pressure and 150 degrees superheat by four oil-fired water-tube boilers of the straight tube type fitted with economizers and air preheaters.

Propulsion will be by a single screw driven by turbines, through single reduction gearing. With the turbines developing 6,300 shaft horsepower, the vessels will have a speed of 14 knots. Cooling water for the main condenser will be provided by a scoop. The auxiliaries will be steam driven.

Deep tanks will be fitted fore and aft for carrying bulk oil cargo or fuel oil or ballast. A separator will be installed for separating oil from the ballast and bilge water.

Staten Island Residents Request New Ferryboats

INFORMATION has been received that the construction of six new passenger ferryboats of the type of the *American Legion,* at a cost of $5,000,000, and restoration of the Stapleton municipal ferry with an investment of $2,500,000, have been requested recently by the Staten Island Civic League in a communication submitted to the commissioners of the sinking fund. The request for restoration of the Stapleton ferry is based on a desire for improvement of vehicular connection with the Staten Island steamship piers.

Di Giorgio Fruit Company Plans New Ship Program

THE Di Giorgio Fruit Company, 25 Broadway, New York, plans to build a number of speedy, modern passenger steamers for operation between the United States and West Indies ports.

The vessels will have accommodations for 100 passengers each and will be used in the operation of a year-round passenger service.

Shipping Board to Equip Vessel with High Pressure Steam Machinery

INFORMATION has been received that plans are in process of preparation by Captain R. D. Gatewood, manager of the maintenance and repair division of the United States Shipping Board Merchant Fleet Corporation, 45 Broadway, New York, for equipping one of the Shipping Board vessels with high pressure steam machinery.

The details of this proposition will be available at a later date, but it is understood that the plan contemplates removing the present boilers and engines in the vessel chosen and installing new high pressure engines and boilers.

Jones-White Bill Stimulus Seen in Prospective Construction

WITH the passing of the Jones-White merchant marine bill, a feeling of optimism prevails among shipowners and shipbuilders. Definite plans of construction are materializing as a result of the advantages of this bill.

The Export Steamship Corporation, 25 Broadway, N. Y., has under preparation plans for four 9,500-ton deadweight combined passenger and cargo steamers, with accommodations for approximately 100 passengers and a speed of 14 knots. This company also contemplates the construction of four ships every two years.

Moore & McCormack Company, Inc., 5 Broadway, N. Y., has stated that two or three new vessels will be planned as a result of the bill.

The Sun Shipbuilding & Drydock Company of Chester, Pa., states that at present it has under consideration quite a number of large cargo vessels, single and twin screw, with speeds varying from 13 to 16 knots, upon which estimates are being prepared, in view of the fact that this bill has become a law.

The Black Diamond Steamship Corporation, 39 Broadway, N. Y., while not contemplating the construction of new vessels at once, expects to consider the matter at a later date.

The Hudson River Navigation Corporation of New York, which has made application to the Shipping Board Construction Loan Fund for 50 percent of the cost of construction of two Diesel automobile and freight carrying vessels, anticipates increasing the amount of this request to 75 percent, in accordance with the plan incorporated in the Jones-White bill.

Other prospective vessels which will probably be constructed in the near future with the aid rendered by the new law include: A third intercoastal liner for the International Mercantile Marine Company, New York, with three additional vessels in contemplation; three new passenger liners for the Australian service

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of the Matson Navigation Company, San Francisco, Calif.; three new Diesel-electric vessels for the Union Gulf Line, and several vessels for the Di Giorgio Fruit Corporation, 25 Broadway, N. Y.

Diesel Conversion Plans To Be Issued June 1

IT HAS been learned that plans and specifications for the conversion of 8 Shipping Board vessels to Diesel-electric drive, will be issued by Captain R. D. Gatewood, manager of the maintenance and repair division of the board, 45 Broadway, New York, about June 1, 1928.

For this second part of the Diesel conversion program it is understood that bids will be asked on 2, 4, 6 and 8 ships and that all contracts will be made on this basis at one time.

Staten Island Shipbuilding Company Gets Contract for New York Ferryboat

THE Staten Island Shipbuilding Company, Staten Island, New York, has been awarded a contract for the construction of one ferryboat for the city of New York, similar to the *American Legion*, at a price of $874,000. Bids for the work were received by Albert Goldman, commissioner of the Department of Plant and Structures, New York, on Tuesday, March 27, 1928, at which time one other tender was received from the Todd Shipyards Corporation of New York, for $912,000.

Bath Iron Works to Build Three Trawlers

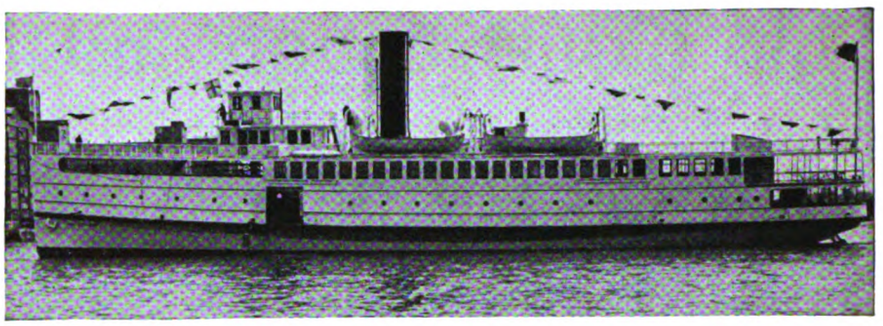
THE Bath Iron Works Corporation, Bath, Maine, recently received a contract for the construction of three trawlers for Messrs. O'Hara, Dunn and Busalacchi Brothers, Boston, Mass. The principal dimensions of these trawlers are as follows: Length overall, 123 feet 6 inches; length on waterline 116 feet; beam, molded, 23 feet; depth, molded amidship, 13 feet; depth, molded poop, 14 feet, and draft loaded, approximately 10 feet 6 inches.

The main propelling machinery on each trawler will consist of a 6-cylinder, 400 brake horsepower, 2-cycle, solid injection, Fairbanks-Morse marine Diesel engine having cylinder diameters of 14 inches with a stroke of 17 inches. The trawlers will have a large, clear deck space and an extra capacity fishhold.

Brown Boveri Co. to Make Offer For U. S. Lines

INFORMATION has been received that the American Brown Boveri Electric Corporation, Camden, N. J., headed by Lawrence R. Wilder, has submitted a proposal to President Coolidge for the acquisition of the Shipping Board's United States Lines.

While exact details contained in the proposal were not made public, Mr. Wilder confirmed the report that his company is desirous of obtaining the Shipping Board's North Atlantic passenger service, including the *Leviathan*.



S.S. New Bedford launched at Fore River yard on May 5

Stern view

Going down the ways

S.S. New Bedford Completed

AFTER completion of a satisfactory trial run from the Fore River plant of the Bethlehem Shipbuilding Corporation, Ltd., Quincy, Mass., to Newport, R. I., on May 19, the new steamer *New Bedford* was delivered to the New England Steamship Company for service between New Bedford and Martha's Vineyard and Nantucket.

The vessel was launched at the Fore River plant on May 5 and is practically a duplicate of the two preceding vessels, *Islander* and *Nobska*, built at the Bath Iron Works, Bath, Me., for this service. The earlier vessels, which have been renamed *Martha's Vineyard* and *Nantucket*, were described in the May, 1924, and May, 1925, issues of MARINE ENGINEERING AND SHIPPING AGE. The main difference between the *New Bedford* and the earlier vessels is that the freight space on the main deck has been increased so that 35 instead of 25 automobiles can be carried and the lunch room on the main deck of the first two boats is on the upper or saloon deck of the *New Bedford*. Two special turntables are arranged on the main deck near the gangways to expedite the loading and discharging of automobiles.

The *New Bedford* is 210 feet 3 inches long overall, with a beam over guards of 50 feet and a depth of 14 feet 3 inches. Her maximum passenger capacity is 2,000 persons and her service speed 15 miles per hour. Propulsion is by a single screw, driven by a four-cylinder, triple expansion engine supplied with steam by two Babcock and Wilcox watertube boilers, burning coal.

Plans for Tanker and Freighter Under Way at Federal Yard

INFORMATION has been received that the Federal Shipbuilding Company, Kearny, N. J., is working on plans and specifications for the construction of an oil tanker for stock, as well as a freighter for the Isthmian Steamship Lines, New York.

The plans under way for the tanker call for a vessel 420 feet in length, 57 feet beam, 26 feet draft and 14,060 tons displacement. The machinery will probably consist of reciprocating steam engines, developing 3,000 horsepower, driving a single screw. The new tanker is to be fitted with a contra propeller. She will have a speed of 10 to 11 knots.

The freighter is to have a length of 470 feet, beam of 63 feet, draft of 26 feet and a displacement of 15,794 tons. In this case the propelling machinery will consist of either geared turbines or turbo-electric drive, developing 6,000 horsepower, driving a single screw. She will have a speed, when loaded, of 14 knots.

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Plans for 2 Diesel-Electric Ferryboats To Be Issued Soon

INFORMATION has been received that the state of New York contemplates the construction of two 115 foot Diesel-electric ferryboats. Plans and specifications are being prepared by Eads Johnson, naval architect, 115 Broadway, New York, and bids will be asked in about one month.

Golden Gate Ferry Co. Plans Construction of Diesel Electric Ferryboats

INFORMATION has been received that the Golden Gate Ferry Company, San Francisco, Calif., is planning the construction of two new Diesel electric ferryboats. The proposed boats will have a capacity of 85 automobiles each. They are to be operated in the Golden Gate Ferry Company's service between San Francisco and Sausalito and between San Francisco and Berkeley.

Two Vessels to be Converted to Burn Pulverized Coal

PLANS are under way at the office of the maintenance and repair division of the United States Shipping Board Merchant Fleet Corporation, 45 Broadway, New York, for the conversion of the vessels *West Alsek* and *West Apaum* to burn pulverized coal. These vessels have a length of 410 feet 5½ inches; beam 54 feet; depth 30 feet, and draft 24 feet. They were built in 1918 by the Skinner and Eddy Corporation, Seattle, Wash., and are known as hard steaming coal burners.

Plans Under Way for Construction of Three Coast Guard Cutters

INFORMATION has been received that plans and specifications for the cinstruction of three new Coast Guard cutters, recently authorized, are now being prepared at the offices of F. A. Hunnewell, Constructor, United States Coast Guard, Superintendent of Construction and Repair, Washington, D. C. As soon as a decision on the general characterists and the type of propelling machinery has been reached, the specifications will be issued. These cutters will be designated as Nos. 50, 51 and 52.

Naval Architects Needed

THE United States Coast Guard is in urgent need of associate and assistant naval architects. For this reason the United States Civil Service Commission has postponed from May 15 to June 15 the close of receipt of applications for open competitive examinations for the above positions at salaries of $3,000 and $2,400 a year respectively.

Competitors will not be required to report for examination at any place, but will be rated on their education, training and experience. Full information may be obtained from the United States Civil Service Commission at Washington, D. C., or the secretary of the United States civil service board of examiners at the post office or customhouse in any city.

Construction and Repair Bids

Bids for 2 Dump Scows and Clam Shell Dredge Opened

TENDERS were received and opened on May 9, 1928, by the Board of State Harbor Commissioners, Union Depot and Ferry House, San Francisco, Calif., for the construction of two dump scows and one clam shell dredge. Bidders submitted tenders on various propositions as follows:

Bids for Dredge

Name	Price Per Original Plans	Days	Modified Plans	Days
Moore Drydock Company	$133,700	180	$	
Golden State and Miners Iron Works	162,480	150	100,607	100
			109,107	150
			122,748	150
			124,928	150
			131,248	150
			149,655	150
Pacific Coast Engineering Company			142,750	180

Bids for Dump Scows

Name	Steel Scows	Days	Wooden Scows	Days
Moore Drydock Company	$62,500	125	$45,800	80
General Engineering and Drydock Co.	68,994	100	39,136	70
Bethlehem Shipbuilding Corporation, Ltd.	84,129	140	59,872	85
Pacific Coast Engineering Company	85,366	150	.....	..
Golden State and Miners Iron Works	.....	...	47,500	100
alternate	.....	...	54,000	100
James Robertson Shipyards	.....	...	63,600	70

Tenders for 40 Steel Discharge Pontoons Opened

PROPOSALS were received and opened on May 12, 1928, by the United States Engineer Office, Federal building, 16th street and 2nd avenue, Rock Island, Ill., for furnishing all labor and materials and performing all work for constructing and delivering forty 38 feet by 14 feet by 3 feet steel discharge pontoons, with the following results:

Name	Price
Midland Barge Company	$ 59,600
Rock Island Bridge and Iron Works	60,680
Dubuque Boat and Boiler Works	61,000
John O'Brien Boiler Works Company	67,490
R. S. Newbold and Son Company	68,000
Charles Hegewald Company	71,960
Marietta Manufacturing Company	72,400
Dravo Contracting Company	73,600
Cullen Company	74,600
Ordnance Department	75,520
Zier Boiler and Sheet Iron Company	82,400
Mississippi Valley Structural Steel Company	85,640
Ayer and Lord Tie Company	124,576

The Midland Barge Company, Midland, Pa., has been recommended for award.

Bids for Two Steel Snag Barges Received

WITH a price of $35,940, the Dravo Contracting Company, Dravo building, Pittsburgh, Pa., submitted the lowest tender for furnishing all labor and materials and performing all work for two 15-ton steel hull snag barges, bids for which were received by the United States Engineer Office, Memphis, Tenn., on April 30, 1928. The general dimensions of the barges are:

Length, overall, 84 feet; breadth, molded, 24 feet; depth at side, molded, 3 feet 6 inches; depth at centerline, molded, 3 feet 9 inches; camber (except at bow), 3 inches straight taper in 11 feet; draft when fully loaded, forward, 1 foot 1 inch; draft when fully loaded, aft, 1 foot 1 inch. The transverse system of framing is to be used. Other bids received were:

Name	Total Price
St. Louis Structural Steel Company	$39,800
Zier Boiler & Sheet Iron Company	47,940
Dubuque Boat and Boiler Works	50,000
Charles Ward Engineering Works	50,950

Bids Received for 5 Barges

TENDERS were received and opened on May 1, 1928, by the Mississippi River Commission, Memphis, Tenn., for furnishing all labor and materials and performing all work for constructing and delivering five sand and gravel barges. The barges are to be constructed of steel throughout, and will have flat bottoms, rounded bilges and straight sides, circular end rakes and a one-foot straight sheer at each end. The framing is to be transverse in the 90-foot amidships body and longitudinal in the rakes. The bids received for the work were:

Name	Price	Days
American Bridge Company, Ambridge, Pa.	$10,496	...
Dravo Contracting Company, Pittsburgh, Pa.	10,590	50
Riter-Conley Company, Pittsburgh, Pa.	10,877	45
Alabama Drydock and Shipbuilding Company, Mobile, Ala.	11,400	100 (first barge and 1 barge every 5 days thereafter)
Midland Barge Company, Midland, Pa.	12,500	120
Charles Hegewald Company, New Albany, Ind.	13,980	210

Sun Co. Bids Low on S.S. Howard Repairs

THE Sun Shipbuilding and Drydock Company, Chester, Pa., was low bidder with a price of $139,800 and a time of 70 days for repairs to the steamship *Howard* of the Merchant and Miners' Transportation Company, Baltimore, Md. Bids for the work were recently received and seven other proposals were submitted as follows:

Name	Price	Days
Newport News Shipbuilding and Drydock Company	$133,468	105
Bethlehem Shipbuilding Corporation, Ltd.	155,585	98
Maryland Drydock Company	160,702	98
Tietjen and Lang Drydock Company	160,227	100
Morse Drydock and Repair Company	164,899	90
Todd Shipyards Corporation	184,750	102
Staten Island Shipbuilding Company	190,725	110

Bids Asked for Constructing Flats

SEALED proposals will be received by the United States Engineer Office, Box 72, Louisville, Ky., until June 11, for furnishing all labor and materials, constructing and delivering nine steele needle flats. Further information may be obtained upon application.

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S.S. Robert E. Lee to be Repaired at Morse Drydock

IT has been learned that the project covering repairs to the steamships *George Washington* and *Robert E. Lee* of the Eastern Steamship Lines, Inc., Boston, Mass., bids for which were received on Monday, April 30, has been abandoned. The prices submitted did not include damages to the *Robert E. Lee*, as a result of her recent accident.

Tenders for repairs to the latter vessel were received and opened by the Eastern Steamship Lines at Pier 18, North River, New York, on Friday, May 11, at 2:00 P. M. A contract for the work was awarded to the Morse Drydock and Repair Company, Brooklyn, New York, at a price of $264,600 and a time of 80 continuous running days. Five other proposals were received as follows:

Name	Price	C.R.D.
Robins Drydock and Repair Company	$333,601	80
Tietjen and Lang Drydock Company	341,200	90
Bethlehem Shipbuilding Corporation, Ltd.	369,237	78
Newport News Shipbuilding and Drydock Co.	385,870	70
W. and A. Fletcher Company	404,119	91

Sternwheel Snagboat Bids Opened

THE United States Engineer Office, Memphis, Tenn., received tenders on April 30, 1928, for furnishing all labor and materials and performing all work for one 30-ton steel hull, steam-driven, sternwheel snagboat. The new vessel is to have the following dimensions: Length, molded, 127 feet; length, overall, 146 feet 6-3/16 inches; breadth, molded, 30 feet; depth at side, molded, 4 feet 4 inches; depth at center line, molded 4 feet 10 inches; camber, 6 inches straight taper in 15 feet and draft 2 feet 9 inches.

The boat is to be equipped with two propelling engines of the horizontal high pressure simple type with cranks of the wheel shaft set at 90 degrees. They are to be constructed for a working pressure of 200 pounds per square inch. The bids received were as follows:

Name	Price
Charles Ward Engineering Works	$ 74,950
Dubuque Boat and Boiler Works	77,000
Dravo Contracting Company	79,000
Charles Hegewald Company	139,900

Tug Transfer No. 3 Repair Contract Awarded

THE New York, New Haven and Hartford Railroad Company, New Haven, Conn., has awarded a contract covering repairs to the tug *Transfer No. 3* to James Shewan and Sons, Inc., 32 Broadway, New York City, at a price of $6,194 and a time of 15 continuous running days. Bids for the work were recently received in the New York office of the New York, New Haven and Hartford Railroad and six other tenders were submitted as follows:

Name	Price	C.R.D.
John W. Sullivan Company	$ 6,892	18
Morse Drydock and Repair Company	7,384	18
Theodore A. Crane's Sons Company	7,500	16
Todd Shipyards Corporation	7,743	14
Tietjen and Lang Drydock Company	7,792	18
Staten Island Shipbuilding Company	8,000	18

Bids for Tug Whitehall Repairs Opened

WITH a price of $21,000 and a time of 40 days, the firm of Jakobson and Peterson, Inc., Brooklyn, N. Y., submitted the lowest proposal covering repairs to the tug *Whitehall* of the Hedger Transportation Company, Inc., 25 Broadway, New York City. Bids for work were received in New York on Monday, April 30, 1928. Other bids submitted were:

Name	Price	Days
Staten Island Shipbuilding Company	$ 27,650	45
Morse Drydock and Repair Company	29,900	44
Todd Shipyards Corporation	36,452	60
Ira S. Bushey and Sons, Inc.	38,640	78
Union Drydock and Repair Company	41,200	44

Barge Altamaha to be Repaired at Todd Drydock

WITH a price of $23,599 and a time of 28 continuous running days, the Todd Drydock, Engineering and Repair Corporation, Brooklyn, New York, submitted the lowest proposal for repairs to the Lambert Transportation Company's barge *Altamaha*. Bids for the work were received in New York on Tuesday, May 15. Other tenders received were as follows:

Name	Price	C.R.D.
Robins Drydock and Repair Company	$25,750	30
Perth Amboy Drydock Company	34,250	30
Morse Drydock and Repair Company	34,314	21
John W. Sullivan Company	34,875	28

Morse Co. Bids Low on Sch. Guilford D. Pendleton Repairs

BIDS were received recently in New York covering repairs to the New York State Nautical School schooner *Guilford D. Pendleton*, and the Morse Drydock and Repair Company, Brooklyn, New York, submitted the lowest tender for the work, with a price of $6,754 and a time of 20 continuous running days. Other proposals were as follows:

Name	Price	C.R.D.
Staten Island Shipbuilding Company	$7,563	23
Union Drydock and Repair Company	7,650	No Time
Tietjen and Lang Drydock Company	9,833	30 (working days)
Todd Shipyards Corporation	9,900	35 (working days)
Robins Drydock and Repair Company	9,980	30 (working days)
Brewer Drydock Company	10,055	60 (working days)

Fletcher Yard to Repair the Eastern Coast and Eastern Guide

A CONTRACT for general repairs and reconditioning of the steamships *Eastern Coast* and *Eastern Guide*, recently purchased from the United States Shipping Board by the Pacific Coast Engineering Company, Seattle, Wash., has been awarded to the W. and A. Fletcher Company, Hoboken, N. J., at a price of $34,400 and a time of 45 continuous running days for the *Eastern Coast* and $28,600 and 24 continuous running days for the *Eastern Guide*. Bids for the work were received and opened on Thursday, April 19, 1928, at the offices of Frank S. Martin and Son, naval architects, New York City.

Robins Co. to Repair S.S. Ellaston

A CONTRACT for repairs to the steamship *Ellaston*, bids for which were recently opened at Boston, Mass., has been awarded to the Robins Drydock and Repair Company, Brooklyn, New York, at a price of $35,186 and a time of 24 days. Other tenders received for the work were:

Name	Price	Days
St. Johns Drydock and Shipbuilding Company	$38,550	24
Morse Drydock and Repair Company	50,750	38
Bethlehem Shipbuilding Corporation, Ltd.	53,985	33
Atlantic Basin Iron Works Corporation	59,500	35

Repairs to S.S. Cathlamet

THE United States Shipping Board recently received bids in New York for repairs to the steamship *Cathlamet*, and the Robins Drydock and Repair Company, Brooklyn, New York, submitted the lowest tender with a price of $36,400. Four other proposals were submitted as follows:

Name	Price
Federal Shipbuilding Company	$38,068
Morse Drydock and Repair Company	39,783
New York Harbor Drydock Company, Inc.	41,528
Theodore A. Crane's Sons Company	45,292

S.S. Bellflower Repair Bids

WITH a price of $26,835, the Morse Drydock and Repair Company, Brooklyn, New York, submitted the lowest proposal for repairing the Shipping Board steamship *Bellflower*, tenders for which were recently received in the New York office of the board. Other bids received were as follows:

Name	Price
Theodore A. Crane's Sons Company	$29,456
Robins Drydock and Repair Company	29,482
Staten Island Shipbuilding Company	29,600
New York Harbor Drydock Company, Inc.	44,681

S.S. Shawnee Repair Contract Awarded

THE Clyde Steamship Company, New York, has awarded a contract to the W. and A. Fletcher Company, Hoboken, N. J., covering repairs to the steamship *Shawnee*. Bids received for the work on May 9, were as follows:

Name	Price
W. and A. Fletcher Company	$16,022
Tietjen and Lang Drydock Company	17,490
Morse Drydock and Repair Company	19,850

S.S. Gaffney Repair Bids

TENDERS were recently received in the New York office of the United States Shipping Board covering repairs to the steamship *Gaffney*, with the following results:

Name	Price
New York Harbor Drydock Company, Inc.	$17,955
W. and A. Fletcher Company	18,400
Federal Shipbuilding Company	19,420
Staten Island Shipbuilding Company	19,500
Morse Drydock and Repair Company	20,774
Tietjen and Lang Drydock Company	21,460

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S.S. West Irmo to be Repaired at Robins Drydock

A CONTRACT for repairs to the Shipping Board steamship *West Irmo*, has been awarded to the Robins Drydock and Repair Company, Brooklyn, New York, at a price of $15,884, bids for which were received recently in New York. Other tenders submitted for the work were:

Name	Price
Morse Drydock and Repair Company	$16,375
James Shewan and Sons, Inc.	16,944
New York Harbor Drydock Company, Inc.	18,484
Staten Island Shipbuilding Company	18,487

Contract Awarded for S.S. Lightburne Repairs

THE Robins Drydock and Repair Company, Brooklyn, New York, has been awarded a contract by the Texas Company, New York, covering repairs to the steamship *Lightburne*, at a price of $16,315 and a time of 10 days. Three other proposals were received for the work on May 11 as follows:

Name	Price	Days
Staten Island Shipbuilding Company	$26,200	13
New York Harbor Drydock Company, Inc.	26,615	16
Morse Drydock and Repair Company	28,653	15

S.S. Tripp to be Repaired at Robins Drydock

A CONTRACT for repairs to the steamship *Tripp* of the United States Shipping Board has been awarded to the Robins Drydock and Repair Company, Brooklyn, New York, at a price of $6,483, bids for which were received at New York on Saturday, May 5, 1928. Other tenders submitted for the work were:

Name	Price
New York Harbor Drydock Company, Inc.	$ 7,386
Morse Drydock and Repair Company	7,413
Staten Island Shipbuilding Company	9,326
Newport News Shipbuilding and Drydock Company	12,030

S.S. Eastern Planet Bids

THE Morse Drydock and Repair Company, Brooklyn, New York, submitted the lowest proposal recently covering repairs to the Shipping Board steamship *Eastern Planet*, with a price of $14,222. Other bids received for the work were:

Name	Price
New York Harbor Drydock Company, Inc.	$15,155
Robins Drydock and Repair Company	15,615
W. and A. Fletcher Company	15,790

Contract Awarded for S.S. Nashaba Repairs

A CONTRACT for repairing the steamship *Nashaba* of the United States Shipping Board, has been awarded to the New York Harbor Drydock Company, Inc., New York, at a price of $5,987. Bids for work were received in New York on Monday, April 30, 1928, and four other tenders were submitted as follows:

Name	Price
Robins Drydock and Repair Company	$ 6,670
Staten Island Shipbuilding Company	6,780
Morse Drydock and Repair Company	7,822
Theodore A. Crane's Sons Company	9,022

Contract for 6 Barges Awarded

A CONTRACT for the construction of 6 barges, of the steel, sunken cargo box type, has been awarded to the American Bridge Company, Frick building, Ambridge, Pa., by the Union Barge Line, Inc., Wabash building, Pittsburgh, Pa., at a price of $100,000.

Shipbuilding School at Fore River Ends Second Season

SPRING ended the second season of the school for steel shipbuilders at the Fore River Plant of the Bethlehem Shipbuilding Corporation, Ltd., at Quincy, Mass. This school is part of the industrial training program of the state of Massachusetts which cooperated with the city of Quincy and the shipyard in its operation.

Although the building of ships at that port is still at a low ebb, sufficient interest was maintained in the studies to permit the conducting of three 10-week periods. As was noted in the classes of last year, the older men among the employees were the leading participants, these men apparently feeling the need of training in the art of shipbuilding.

With the departure of the giant airplane carrier U. S. S. *Lexington* in January, a large reduction in the force seriously impaired the morale of the students. A miscellaneous assortment of smaller craft, however, kept part of the staff intact and studies continued, being made broad enough to encompass the range of contracts now being executed.

Henry E. Gould

The school revealed considerable strength throughout the season and aroused much interest among the employees in general as well as the population of the surrounding areas. The Fore River Plant has operated in the past on such an extensive scale that nearly every family thereabouts is in some manner connected or familiar with shipbuilding.

LECTURES SUPPLEMENT REGULAR TRAINING

Aside from the regular training in plan reading and shipbuilding methods a program of lectures on pertinent subjects was arranged. These were given by leading members of the marine fraternity of that port and served to indicate that much highly developed talent is available for the purpose. The lecturers comprised the executives of the plant, naval officers, Coast Guard officers, yard foremen and marine draftsmen.

Each lecture was attended by representatives of all departments as well as by the students primarily interested. This phase has proved particularly fruitful in aiding the industry. A round table question period at the close of each talk revealed the interests of the assemblage as being of wide scope touching every aspect of marine operation.

GENERAL MANAGER STARTED THE COURSE

This study course was made possible through the desire of Harry E. Gould, general manager of the Fore River Plant,

Capt. Q. B. Newman, U.S.C.G.

to offer his organization every means available for the promotion of the marine industry. Mr. Gould entered on the work of education within the plant with the characteristic foresight and vigor that has made him a leader in active shipbuilding circles as well as locally where he is prominent in many movements aiming at social betterment.

John E. Burkhardt, Formerly associated with the Bath (Maine) Iron Works and now chief engineer of the Fore River Plant, expressed himself as being well pleased with the functioning of the shipbuilding classes. He saw particular merit in the fact that many members of the design division showed a live interest in the advanced lectures.

Lieut. Comdr. J. D. Crecca, C.C., U.S.N.

The possible development of such a course was indicated in the original idea contributed by William Binley, Jr., naval architect of the Fore River Plant. An alumnus of Massachusetts Institute of Technology, Mr. Binley secured from that institution, through the kind offices of Professor Henry H. W. Keith, its collection of several hundred stereopticon slides, covering the whole range of shipbuilding

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from the earliest known era down through the ages to the present day. Described in detail by Mr. Binley, these slides made a highly valuable study in themselves, a feature being the presence of several slides which pictured ships in various forms of distress as a result of improper loading, storms at sea, and the effect of late warfare.

A highly potent phase of the work was the special value of talks given by such speakers as Captain Quincy B. Newman, U. S. C. G., who for the past eight years has been engineer-in-chief of the Coast Guard. During this period designs were developed for the construction of 5 cutters for the service. In the design of these ships were incorporated the latest requirements of the Coast Guard. The Fore River Plant secured the contract for these cutters and Captain Newman is now stationed there as inspector of machinery. A largely attended session of the school listened with marked attention to Captain Newman's talk which explained away many seeming difficulties in design and hastened construction to that extent.

SPEAKERS

Following is a list of the lectures and speakers:

"Shipbuilding Problems" by Harry E. Gould, general manager.
"Structural Design" by James Howard, ship draftsman.
"Modern Cargo Ships" by Alfred B. Brown, chief draftsman.
"Heavy Cruiser Design" by Capt. W. P. Druley, C.C., U.S.N., naval constructor.
"American Shipbuilding Progress" by Archibald J. Grassick, foreman loftsman.
"Delivery of A. R. A. *Moreno* and *Rivadavia*" by Walter W. Watson, assistant to vice-president.
"Building the U. S. S. *Lexington*" by Thomas J. Larkin, way foreman.
"Routing for Production" by Gilbert A. Booth, superintendent order dept.
"Naval Inspection" by Lieut. A. S. Pitre, C.C., U. S. N., assistant naval constructor.
"Value of Study" by Kimball F. Sturtevant, ship draftsman.
"Personal Instruction" by Ralph M. Strickland, ship draftsman.
"Arming Fighting Ships" by Plato F. Waplington, ordnance engineer.
"Engineering on the Yukon" by Capt. H. N. Wood, U. S. C. G., inspector of machinery.
"Practical Engineering" by Harry E. Gould, general manager.
"Trend of Steel Ship Design" by Charles A. Hales, chargeman, hull drafting.
"Building Safety Into Ships" by Frank Conway, safety engineer.
"Naval Machinery Inspection," by Capt. Louis Shane, U. S. N., inspector of machinery.
"Hull Erection" by William H. Collins, hull superintendent.
"Building Coast Guard Ships" by Capt. Q. B. Newman, U. S. C. G., inspector of machinery.
"Original Marine Engineering" by Harry E. Gould, general manager.
"Steel Shipbuilding Development" by William Binley, Jr., naval architect.
"Heat Treatment" by Edward B. Ashworth, foreman blacksmith.
"Personal Instruction" by Richard H. Blackman, ship draftsman.
"Industrial Organization" by Lieut. Comdr. J. D. Crecca, C.C., U.S.N., assistant naval constructor.
"General Remarks" by Harry E. Gould, general manager.
"Engineering Far and Near" by Wm. Chisholm, ship draftsman.
"Employee's Representation" by Harry E. Parker, manager's representative.
"Shipbuilding Organization" by Harry E. Gould, general manager.
"Drafting in General" by Joseph P. Zamouski, engine draftsman.
"Bethlehem Subsidiaries" by R. P. Campbell, superintendent of machinery.

The organization of the shipbuilding school came under the direction of Harry E. Parker, service manager of the Fore River Plant. The immediate charge reposed in Angus D. MacDonnell of the hull drafting room as instructor who brought to the work an extensive experience as a steel shipbuilder and as an instructor.

Great Lakes Notes

Two Recent Bills Affect Great Lakes Navigation

TWO bills have recently been passed in Congress amending the Act of February 8, 1895, entitled "An Act to regulate navigation on the Great Lakes and their connecting and tributary waters." The only changes proposed by the first bill are the increase in the tonnage of tugs from 30 to 100 tons and the addition of the word "net" after the word "register." The reason for this change is as follows:

"The law as originally written, and which was enacted some years ago, provided that the lights on Great Lakes harbor tugs under 30 tons register shall be regulated by rules prescribed by the Board of Supervising Inspectors of Steam Vessels. Under the authority of that provision, the board has adopted a rule providing that tugs under 30 tons register shall carry the regular red and green side lights, but that the white light forward may be on top of the pilot house and not necessarily 20 feet above the deck, as is the rule for other vessels, and that the second light, shown when the tug has a tow, shall be hung not less than 3 feet vertically above or below the headlight, and not 6 feet, as provided for other vessels in rule 4 of the White law. Since the enactment of the White law the size of harbor tugs has increased, and at the present time nearly all of the harbor tugs are over 30 tons register (net), the larger number running between 50 and 100 register tons (net), and while this tonnage has increased, they have been operating, by common consent, as though they were under the rule applying to tugs of 30 tons or under, for to require these vessels to have high masts would interfere very materially in getting around the vessels, to say nothing of the difficulties encountered where there are many bridges, especially at a port like Chicago, where the masts would seriously interfere with navigation."

The second bill regulates the disposition of lights on vessels of the Great Lakes. The reason for these changes are as follows:

"The principal reason for this legislation is the greatly increased length of the vessels since the White law was enacted in 1895. At that time there were no vessels 400 feet in length, the first one of that length being built some time during the year after the law was passed. The majority of the vessels were from 350 feet downward in length. The distance between the prescribed anchor lights on these long vessels is so great that on a dark night when the hull is not distinguishable from an approaching vessel, the officers of the approaching vessel are liable to be and have been misled into thinking that this space was an unobstructed passage. This is the reason for requesting the change in rule 2 and the final provision for deck lights in every interval of a hundred feet when the vessel is at anchor.

"The proposal that two lights be displayed on the after spar is designed to render compliance with the provision of the law which requires that these lights shall be visible all around the horizon. The law authorized only one light, and necessarily there is an arc of invisibility created by the spar on which the light is placed.

"The other changes asked for as to the placing of lights on both sides of the keel are to overcome the difficulties that are encountered with the new types of vessels, which have larger houses fore and aft, larger smokestacks, and, in some cases towering unloading machinery, which obstruct the view of the range lights if placed directly over the keel."

Officers Elected for the Lake Carriers' Association

AT the recent annual meeting of the Lake Carriers' Association, Hollenden Hotel, Cleveland, Ohio, the election of the executive committee resulted in the return of all members, except the replacement of C. D. Dyer by Captain Joseph S. Wood, of the Wilson Transit Company, Cleveland. Mr. Dyer had resigned. The committee follows: J. S. Ashley, chairman; J. J. Boland, Harry Coulby, J. Cary Evans, A. F. Harvey, Captain C. L. Hutchinson, H. K. Oaks, A. E. R. Schneider, G. A. Tomlinson and H. S. Wilkinson.

Alternates: John T. Kelly, W. H. McGean, James McAlpine, Captain W. G. Stewart, A. C. Sullivan, W. P. Schaufele, J. Burton Ayers, A. H. Ferbert and A. E. Cornelius. One vacancy exists through the death of A. W. Thompson.

Officers were unanimously returned as follows: J. S. Ashley, president; L. C. Sabin, vice president; Newton D. Baker, general counsel, and George A. Marr, secretary-treasurer.

Ore Tonnage On Great Lakes Declines

ACCORDING to a statement recently prepared by Albert B. Kerr, of the M. A. Hanna Company, 1300 Leader building, Cleveland, Ohio, no addition was made to the ore tonnage of the Great Lakes fleet last year, and the elimination of lake tonnage in 1927 was the greatest in several seasons. The total tonnage stricken off the list of ore carriers last year was 62,800 tons, as against 65,900 in 1925. Of the vessels that have left the ore trade, the *Rapprich* and *Savage* have been converted into self-unloaders; the *Coralia* and *Neilson* have gone into the automobile trade; the *C. M. Warner, Rockefeller* and *Niagara* have become sand carriers; the *Leslie, Eads* and *No. 137* have gone into Canadian registry, and the *E. W. Oglebay* was wrecked.

The statement adds:

Allowing 18 trips each per boat, this means that during 1927 there were eliminated over 1,000,000 tons yearly from the ore carrying capacity of the fleet.

The total number of vessels engaged in carrying ore amounted to 346, with a trip capacity of 2,747,000 tons and an average size of 8,228 tons.

The Pittsburgh Steamship Company, Cleveland, Ohio, holds first place in number of boats and tonnage capacity, the Interlake Steamship Company, Cleveland, second; the Hutchinson Company, Cleve-

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land, third; Cleveland-Cliffs Steamship Company, Cleveland, fourth, and the Great Lakes Steamship Company, Cleveland, fifth.

Chief Engineer Appointments for Great Lakes Companies

APPOINTMENTS of chief engineers who will command the fleets of the Valley Steamship Company, Morrow Steamship Company and Lakewood Steamship Company, Cleveland, Ohio, for the coming season, were recently announced and are as follows:

Vessel	Chief Engineer
Harry T. Ewig	H. B. Muhlitner
J. M. Kennedy	Robert Holt
E. G. Mathiott	F. W. Hunt
S. B. Way	W. J. Radke
John Anderson	A. W. Muhlitner
Thomas Britt	Edward Jacques
D. E. Callender	Henry Fritz
A. E. R. Schneider	A. A. Smedley
G. N. Wilson	Charles Wolvin
M. A. Reeb	Joseph Garant

Vessels Recently Built at the Manitowoc Shipyard

THREE new steel vessels and one rebuilt freighter were recently launched at the yards of the Manitowoc Shipbuilding Corporation, Manitowoc, Wis. The vessels are the property of the Great Lakes Dredge & Dock Company, Chicago, Ill. Officials of the company and more than 100 guests attended the ceremony.

Mrs. J. M. Cushing, wife of the president of the company, christened a tug that bears the name of Mr. Cushing. The dredge *Michigan* was christened by Mrs. A. Nebbling, wife of the vice president and chief mechanical engineer. The vessels are the first constructed by the Manitowoc Shipbuilding Corporation for the company. The tug *Cushing,* reported to be the largest of its kind on the Great Lakes, is 125 feet long, with a beam of 27 feet and a depth of 16 feet. It is equipped with a 1,000 horsepower Busch-Sulzer Diesel engine.

Standards for Medicine Chests Proposed

PRELIMINARY drafts of proposed standards for three sizes of medicine chests and lists of contents have been sent out to the membership of the American Marine Standards Committee for approval.

These proposed standards, for medicine chests and medical and surgical supplies and equipment for ocean-going vessels, for coastwise and lake freighters, and for small vessels have been prepared under guidance of the United States Public Health Service. They are tentatively approved by the technical committees on hull details and on ship operation details and supplies of the American Marine Standards Committee. Their promulgation is proposed in the interest of good economy in ship operation and welfare at sea.

When the standards are approved, they will be issued in a single publication in the form adopted for the American Marine Standards series. They will be reviewed periodically and revised, if and when advisable, in order to keep abreast of general practice and requirements of marine service.

Supply Trade

Protests Against Shipbuilding in Navy Yards

THE Haskelite Manufacturing Corporation, Chicago, Ill., has taken a leading part in the campaign against the building of the naval vessels in Government navy yards. Officials of this company have written letters of protest against this bill to every senator and congressman from Michigan and Illinois and also to the manufacturers' associations in these states, receiving favorable replies in most cases.

Westinghouse Annual Report

THE Westinghouse Electric & Manufacturing Company has issued its annual report to stockholders which shows that the sales of the company for the year ending March 31, 1928, were, in round numbers, $175,000,000; the net manufacturing profit was $14,000,000; the net income available for dividends was $15,600,000; and the earnings per share of stock (preferred and common) were $6.57 or 13.4 percent. Dividends were paid during the year on both stocks at the rate of 8 percent per annum or $4.00 per share of $50 par value. These figures indicate a slight decrease in business as compared with the previous year, when the annual sales totalled $185,500,000, and $6.80 was earned per share. The balance sheet shows current assets aggregating $122,000,000, which is more than eight times the current liabilities aggregating $15,000,000.

McIntosh & Seymour Issues Monthly Marine Bulletin

THE McIntosh & Seymour Corporation, Auburn, N. Y., has recently distributed a bulletin devoted to a discussion of the advantages and economies of the Diesel engine for dredges. This bulletin marks the first of a series which will be published monthly.

The leading article, entitled "Diesel Engines for Dredge Power," outlines the many advantages of Diesel power over the other sources of power for dredges.

A complete description of the 30-inch Diesel electric hydraulic dredge *Clackamas* of the Port of Portland, Ore., is given together with operating and construction data of great value. Comparisons of maintenance costs between the *Clackamas* and steam dredges show a very favorable result for the Diesel dredge.

The remainder of the bulletin is devoted to descriptions of other dredges. Among these are the 27-inch hydraulic dredge *Norfolk*, the 12-inch Diesel dredge *George Simons, Jr.*, the 24-inch hydraulic dredge *C. B. Harris*, the 20-inch hydraulic dredge *Raymond*, and the four hydraulic hopper dredges, *A. Mackenzie, W. L. Marshall, Dan C. Kingman* and *William T. Rossell.*

Business and Personal

The **California & Eastern Steamship Company** has moved its New York offices from 26 Beaver street to Room 815, 8-10 Bridge street.

The **Ellis Channel System,** New York. has moved its offices from 30 Church street to 33 Rector street, New York.

The **Haskelite Manufacturing Corporation,** Chicago, Ill., recently moved to larger quarters at 120 South La Salle street.

The **Luckenbach Steamship Company, Inc.,** New York, has opened a district office at Tacoma, Wash., with **D. J. Whitman,** commercial agent in charge.

The **American Bureau of Shipping Great Lakes Department** has moved its Milwaukee, Wis., office from 1404 First Wisconsin National Bank building to Room 928 Empire building.

The **Woodbury & Wheeler Company,** Portland, Ore., and **Charles H. Harden & Company,** Seattle, Wash., have been appointed Pacific Coast distributors of the **Lunkenheimer Company,** Cincinnati, Ohio.

The **Argonaut Steamship Line,** New York, operating in the intercoastal trade, has filed a certificate with the Secretary of State at Albany, changing its corporate name to **Atpac Steamship Corporation.**

The **International Mercantile Marine Company** will shortly open a new inland freight office in Cleveland, Ohio, for the **Panama Pacific Line,** with **Lawrence W. Welch** of the New York staff in charge.

The steamship *Havana,* purchased by the **Columbia Pacific Company,** Portland, Ore., from the **United States Shipping Board,** has been renamed the *Jefferson Myers,* in honor of the Shipping Board commissioner from the North Pacific district.

Charles H. Jackson has been appointed general sales engineer of the **Bayley Blower Company,** of Milwaukee, Wis. Mr. Jackson's former position of chief engineer has been filled by **Ernest Szekely,** formerly associate professor of mechanical and electrical engineering at the **University of Budapest.**

The **Interocean Steamship Company,** with headquarters in Philadelphia, Pa., has been appointed agent of the Atlantic coast for the **State Steamship Line** and the **Tacoma Orient Line,** effective May 15. The main offices of the new agency are located in Philadelphia with a branch in New York.

W. D. Lindsey, former executive vice-president of the **Garrison Fire Detecting System, Inc.,** of New York, has recently been elected president of that company, succeeding **Richard T. Merrick,** who died a few months ago. Prior to Mr. Lindsey's association with the Garrison Company in 1925, he spent 15 years in the service of the **Western Electric Company** in both an engineering and an advertising capacity.

Theodore Beran, commercial vice-president of the **General Electric Company** in charge of the New York district, has retired. Mr. Beran was born in 1862 at Springfield, Mass., was educated in the public schools of New York city and later received an A. B. degree from the College of the City of York city and later received an A. B. the New York district since 1903 and was elected vice-president in 1926.

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The **American Ship & Commerce Navigation Corporation,** a subsidiary of the **American Ship & Commerce Corporation,** New York, has filed with the Secretary of State at Albany a certificate changing its corporate name to **Baltimore-Atlantic Steamship Company, Inc.,** due to a desire to have a name more in keeping with the field of operation of its vessel, the *Mount Clay.* All other tonnage has been sold by the American Ship & Commerce Corporation.

Obituary

James J. Wood, consulting engineer of the **Fort Wayne Works** of the **General Electric Company** and one of the pioneers of electric lighting by arc lamps in America, died recently at Asheville, N. C. He had just passed his 71st birthday. Mr. Wood was often grouped with three other contemporary pioneers, Thomas A. Edison, Professor Elihu Thomson and Charles F. Brush. These four men were sometimes referred to by General Electric people as the "big four," because from their work in the earliest period has developed directly the General Electric Company of today. Mr. Wood was the youngest of the group; the other three are still living.

Trade Publications

MARINE ENGINES.—The Buda Company of Harvey, Ill., has issued a pamphlet containing prices and specifications of five small gasoline motors for yacht service.

TUBE COUPLINGS.—The Parker Appliance Company of Cleveland, O., has issued specifications and instructions for the installation of Parker tube couplings and copper tube, together with price lists for standard pipe shapes.

DIESEL YACHTS.—The third edition of a booklet on "Diesel Yachts" has been published by Cox & Stevens, naval architects, New York. Descriptions of twenty-eight yachts designed by this firm together with testimonials from the owners are included.

WINTON NEWS.—The fourth issue of *Winton News,* a monthly bulletin published by the Winton Engine Company, Cleveland, O., has been distributed. This issue contains a description of the new steel Diesel electric freight boat *Edward F. Farrington* and the steel schooner *Starling.*

ELECTRICAL EQUIPMENT.—The General Electric Company of Schenectady, N. Y., has issued a set of loose-leaf data sheets giving information concerning various types of electrical equipment. This equipment includes switches, controllers, welders, generators, compressors, motors and turbines.

DECK SCRUBBING MACHINE.—A folder has been received from the Finnell System, Inc., of New York, describing the Finnell deck scrubbing and polishing machine. This machine has a wide application aboard ship for scratching down iron decks, scrubbing wooden decks or waxing linoleum.

OAKUM.—Circulars have been distributed by the E. T. Rugg Company, Newark, O., describing Rugg oakum for the shipbuilder, plumber and repairer. An innovation by Rugg is the packing and wrapping of oakum in airtight, moisture proof packages, keeping the product in the pink of condition.

NOZZLES.—Andrew J. Morse & Son, Inc., of Boston, Mass., has issued its catalogue No. 51 entitled "The Invincible Nozzle." This catalogue illustrates many devices for use in fire fighting. Installations of this equipment on many fire boats are described and the use of these nozzles for all types of high pressure fire apparatus is set forth together with prices for the many classes of supplies.

PACKINGS.—A catalogue of packings, jointings and mechanical rubber goods manufactured by James Walker & Company, Ltd., mechanical engineers, New York, has been received. Many types of packing for various uses are described. Among these are steam packings, draulic and water packings, refrigerator packings, oil packings, boiler packings, jointings and mechanical rubber goods.

ELECTRIC RANGES.—A bulletin has been received from the Edison Electric Appliance Company, Inc., of Chicago, Ill., describing the economy of electric cooking and baking equipment for use aboard ship. Particular reference is made to the installation aboard the *S. S. Malolo,* which demonstrates the advantages of electric equipment for lowering operating cost, saving deck space, aiding ventilation and reducing upkeep and fire risks.

INSULATION.—The Cork Import Corporation of New York has issued two bulletins explaining the application of Navoid cork board insulation and Navoid cork covering for refrigerated lines and tanks and drinking water systems. Cork board may be used for all types of large insulation including walls, roofs and floors for refrigeration spaces.

CHART.—The John C. Dolph Company, insulation specialists, Newark, N. J., has published Dolph's Solvent and Calculation Chart for use in shops where insulating varnish is used. This chart eliminates all guess work and enables the user to determine in advance just the right amount of thinning to add to a varnish to bring it to the required gravity for dipping. In addition to the solvent chart there are drawings of removable head drums with instructions for calculating the number of gallons of varnish they contain at all times.

FEED WATERS.—A booklet has been received from J. H. Gullak & Company, Inc., chemical and mechanical engineers, New York, entitled "Internal Feed Water Treatment in its Theory and Practice." This work treats the subject from both a chemical and a practical standpoint. Scale formation, corrosion, caustic embrittlement and foaming are discussed and the practical corrective treatment is explained in order to enable the engineer to discriminate between the products offered him so that his choice will be dependent on his own knowledge of what would logically appear to be the best solution of his problems.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—W. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc. 50. Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club. 4th and River Streets, Hoboken, N. J. Secretary—Fred L. Broad.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association. 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty Street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 149 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aëronautique. Secrétariat Genýral—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici In Italia.

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